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Dräger medical
A Dräger and Siemens Company

Setup and Installation Manual

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Narkomed 4
Anesthesia System

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Section 1
Introduction

Introduction

This manual provides the basic information needed to setup and install a NARKOMED 4 Anesthesia Machine. The setup and installation shall be followed by the performance of the PMS Procedure as specified in Section 6. The setup, testing and PMS must be performed by or under the direct supervision of an authorized North American Dräger representative. This manual also includes procedures for cleaning and routine maintenance. The instructions are divided into the following sections:

Section 2 shows how to correctly move the anesthesia machine and lists the precautions that must be observed while the machine is in transit.

Section 3 outlines installation of breathing circuit components, sensors, display arm and Datagrip, and optional equipment such as vaporizers, scavenger systems, auxiliary lamp, outlet strip and printer.

Section 4 provides instructions for connecting the gas supplies to the anesthesia machine, along with the precautions to be observed when installing the cylinders and connecting the pipeline supplies.

Section 5 provides instructions for connecting the anesthesia machine to electrical power and verifying correct power-up indication on the machine.

Section 6 provides instructions for testing and performing Periodic Manufacturer's Service (PMS) to ensure that the machine is ready for service.

Section 7 provides instructions for cleaning the equipment and procedures for performing routine maintenance.

WARNINGS

Warning statements are used in this manual with procedures which if not performed correctly could result in personal injury.

CAUTIONS

Caution statements are used in this manual to alert service personnel to the possibility of damage to the equipment if a procedure is not performed correctly.

NOTES

Note statements are used in this manual to clarify information that may not be readily obvious, such as a secondary cause and effect.

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Section 2
Moving the Narkomed 4

Getting the Machine Ready to Move

Prepare the machine so that it can be moved safely:

- unplug the power cord
- retract the boom arm and remote display
- disconnect all external hoses
- remove all external monitors and equipment
- remove the absorber system

Moving the Machine

Perform the following steps to move the anesthesia machine.

WARNING: The anesthesia machine should only be moved by people who are physically capable of handling its weight. North American Dräger recommends that two people move the anesthesia machine to aid in maneuverability. Exercise special care so that the machine does not tip when moving up or down inclines, around corners, and across thresholds (for example, in door frames and elevators). Do not attempt to pull the machine over any hoses, cords, or other obstacles on the floor.

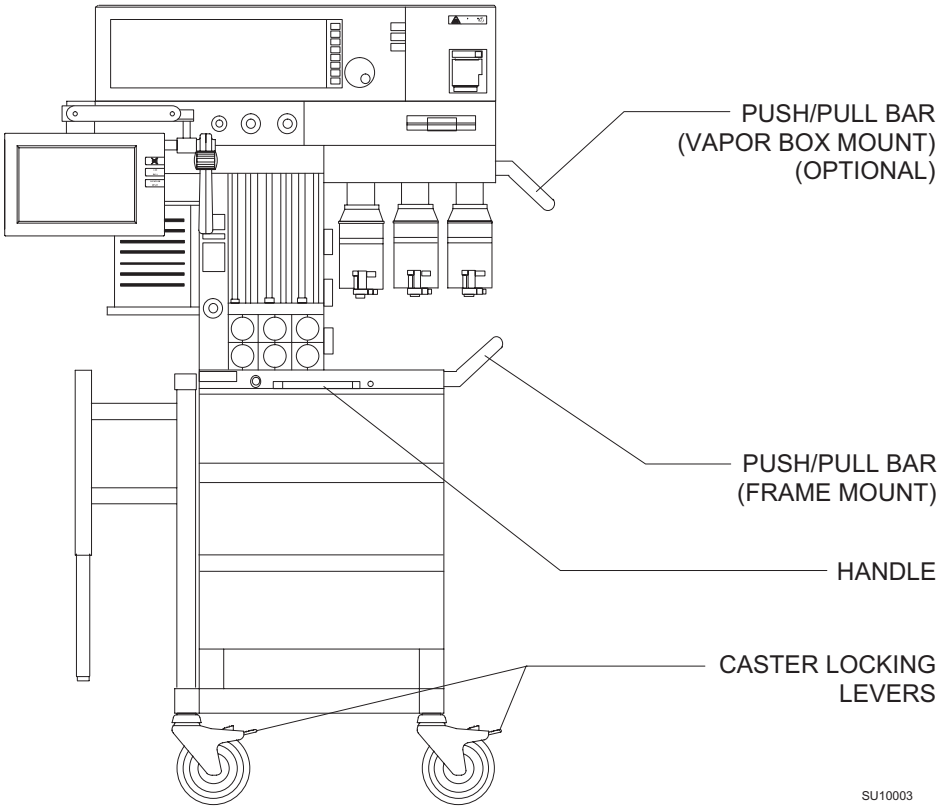
1. Unlock the front casters by stepping on their locking levers.

   Do not attempt to move the machine while the casters are locked.

2. Using only the handle or push/pull bars shown in the illustration, move the machine.

   Do not push or pull the anesthesia machine using the absorber system, vaporizers, ventilator bellows, cord wrap, boom arm, or display arm.

Section 2
Moving the Narkomed 4



Section 3
Setup and Installation

Setup Checklist

Following is a checklist for the initial setup of a NARKOMED 4 Anesthesia Machine. This setup must be performed by or under the direct supervision of an authorized North American Dräger service representative. Items 1 thru 19 are described in this section; items 20 thru 23 are outlined in subsequent sections.

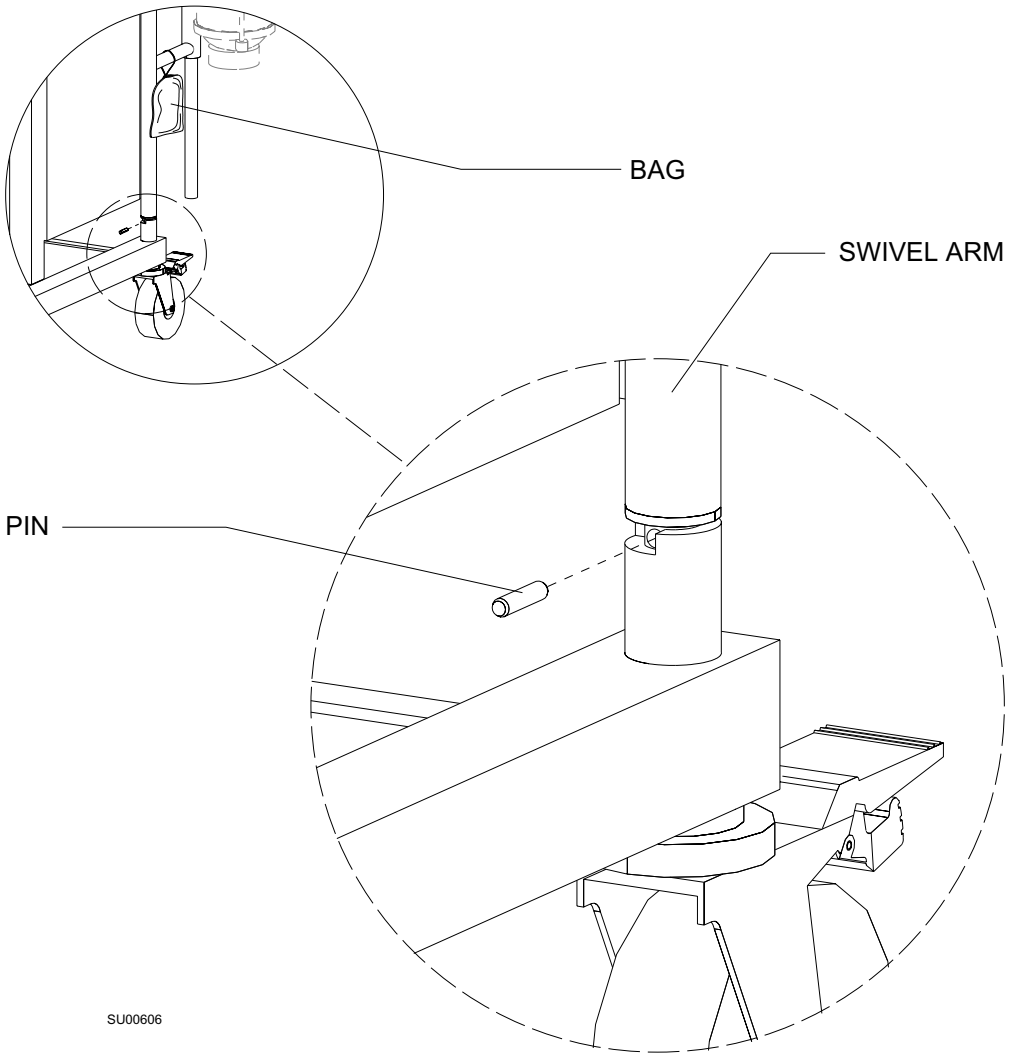
1. Install the absorber swivel arm stop pin
2. Install the vaporizers (optional)
3. Install the absorber system (optional)
4. Install the breathing pressure pilot line
5. Install the gas analyzer sample line
6. Install the AUTO/BAG sensor cord
7. Install the oxygen sensor
8. Install the ultrasonic flow sensor
9. Install the oximeter sensor
10. Install the Bain Circuit adapter (optional)
11. Install the fresh gas oxygen sensor adapter (optional)
12. Connect the open reservoir scavenger system (optional)
13. Connect the passive scavenger system (optional)
14. Install the display arm (and optional patient line boom arm)
15. Install the Datagrip assembly and cables
16. Install the manual sphygmomanometer gauge (optional)
17. Install the auxiliary lamp (optional)
18. Install the outlet strip (optional)
19. Connect the gas supplies
20. Connect the machine to electrical power
21. Perform a Periodic Manufacturer's Service (PMS) procedure. This procedure must be performed by an authorized North American Dräger service representative as part of the initial setup.

Section 3
Setup and Installation

Installing the Absorber Swivel Arm Stop Pin

Install the stop pin as follows:

1. Remove the roll pin from the bag hanging on the swivel arm.
2. Rotate the swivel arm so that the hole near the bottom of the arm faces the back of the machine.
3. Hammer the pin into the hole until it is flush with the swivel arm.



Section 3
Setup and Installation

Selecting the Vaporizer Order

The vaporizers should be installed in the following order as viewed from the front of the machine unless otherwise specified by the customer:

- Left position: Halothane
- Center position: Enflurane
- Right position: Isoflurane

WARNING: Incorrect positioning of vaporizers will result in an incorrect analysis of the anesthetic gas.

NOTE: If a non-standard vaporizer arrangement is specified by the customer, contact the NAD Service Department for specific gas analyzer setup and calibration.

NOTE: A desflurane vaporizer may be installed in the Right vaporizer position. Refer to Service Procedure SP00091 for installation of the TEC 6 desflurane vaporizer.

Installing the Vaporizers (Optional)

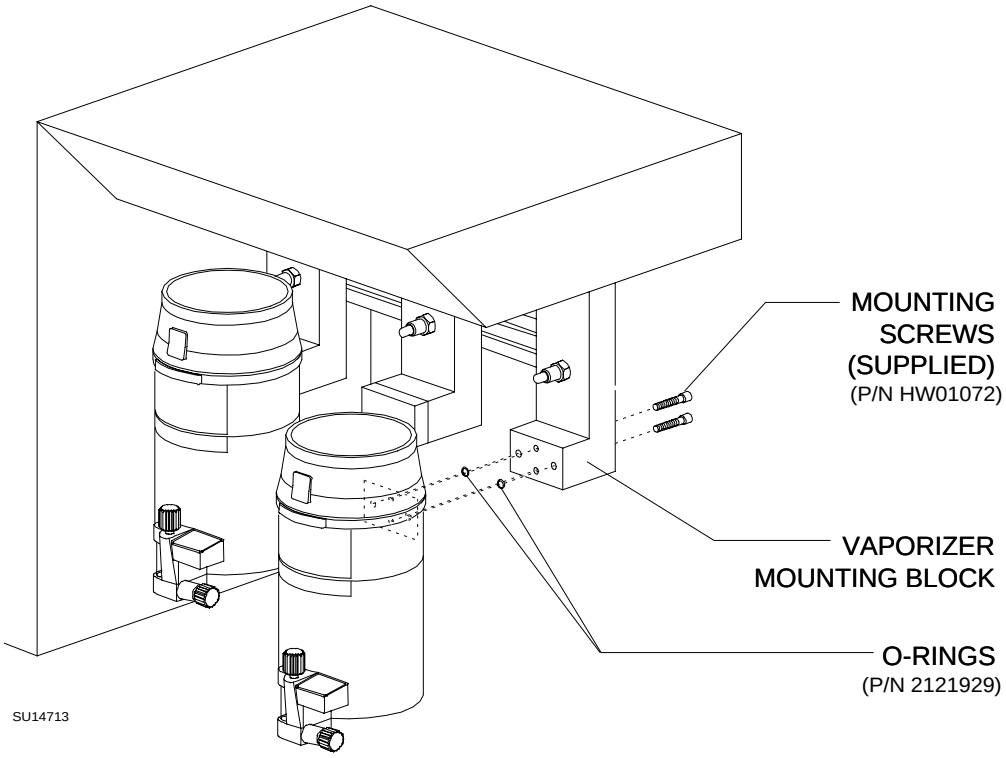
To install the vaporizer during initial setup:

1. Remove the vaporizer mounting block cover.
2. Remove the vaporizer from its shipping container.
3. Remove the tape from the back of the vaporizer. Verify that the vaporizer's O-rings are present at the inlet and outlet ports.
4. Use the supplied screws to secure the vaporizer to the vaporizer mounting block in the correct position on the machine. (See "Selecting the Vaporizer Order" above.) Tighten the screws to a torque of 285 N cm (25 inch pounds).

WARNING: Do not use any screws other than the ones supplied.

5. Test the exclusion system for proper operation.

Section 3
Setup and Installation



Filling the Vaporizer

See the appropriate separate manual, supplied with vaporizers available for use with the Narkomed 4.

Handling the Vaporizer

If a vaporizer is dropped during handling, or if its handwheel exhibits a lack of resistance (spins freely), or if a gas analyzer maintains a zero reading after the handwheel has been turned to a labeled concentration, do not use the vaporizer. Return the vaporizer to the North American Dräger Technical Service Department.

Section 3
Setup and Installation

Installing the Absorber System

Install the absorber system as described below. This installation procedure presumes the use of an appropriate scavenger system.

WARNING: The NARKOMED 4's patient breathing system must not be used in conjunction with any additional components that establish a flow direction.

WARNING: Hoses and bags attached to the 22 mm hose terminals of the inspiratory valve, expiratory valve, ventilator hose connection, and breathing bag mount must comply with current ANSI standards.

1. Place the absorber mounting stud into the top of the absorber pole. Be sure that the O-ring is on the mounting stud.

2. Tighten the set screw on the absorber pole to lock the absorber in place.

WARNING: Do not pinch or kink the fresh gas hose leading from the fresh gas common outlet to the absorber.

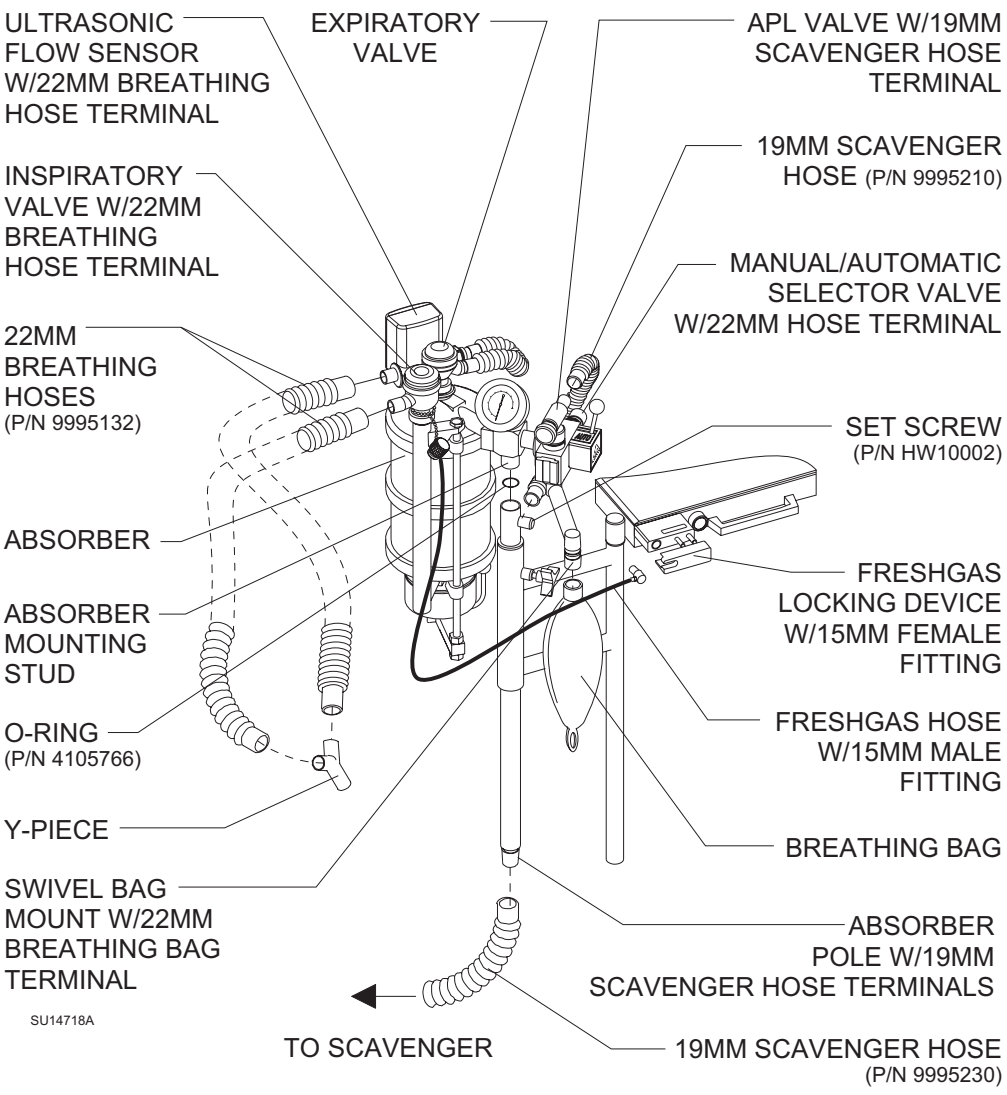
3. Pull out the fresh gas locking bar, located on the front of the NARKOMED 4, to its extended position. Insert the 15 mm male fitting on the fresh gas hose axially into the 15 mm female terminal. Release the spring-loaded locking bar over the fitting, allowing it to "lock" the fitting into place.

WARNING: To prevent leaks and misdirection of gas pathways, all hoses should be correctly and tightly fitted, as shown in the illustrations. Take special care to make sure that all 19 mm hoses are attached to the proper 19 mm connectors. Possible machine malfunction and harm to the patient could occur if the scavenger hoses are attached to any 22 mm connection.

4. Attach a 22 mm breathing hose between the ventilator bellows 22 mm terminal marked VENTILATOR HOSE, and the 22 mm terminal on the rear of the manual/automatic selector valve marked VENTILATOR HOSE.

5. Attach a 22 mm breathing hose between the 22 mm hose terminal on the inspiratory valve marked INSPIRATION, and one side of the Y-piece.

Section 3
Setup and Installation

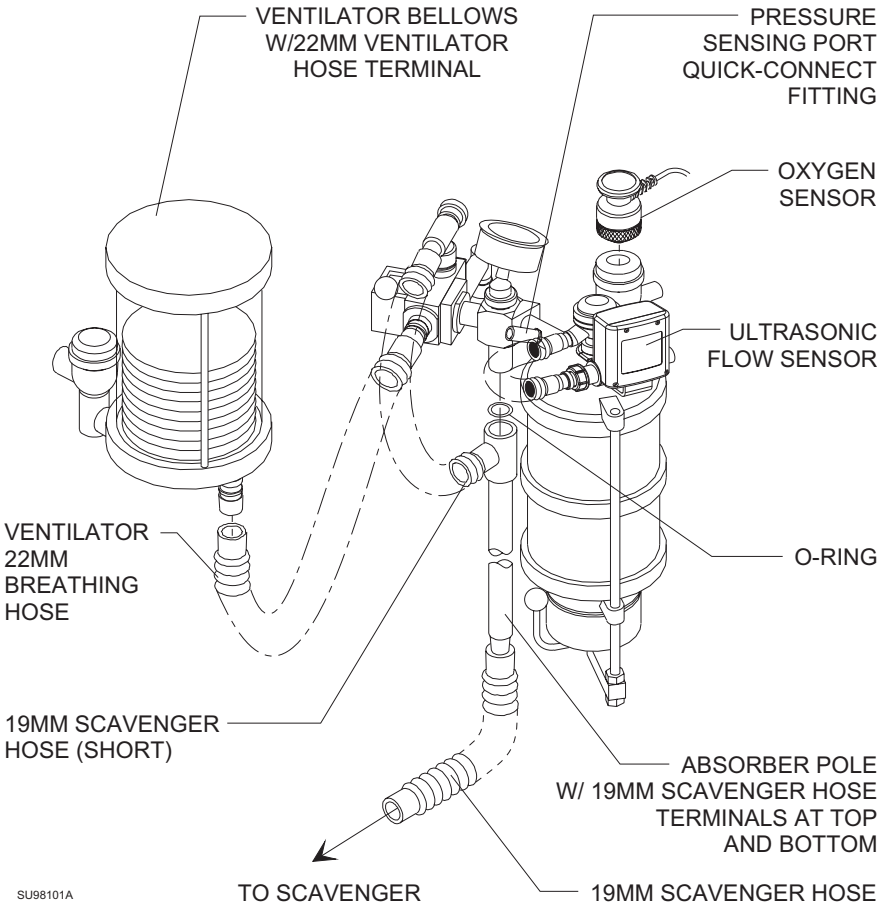

ULTRASONIC FLOW SENSOR W/22MM BREATHING HOSE TERMINAL
EXPIRATORY VALVE
APL VALVE W/19MM SCAVENGER HOSE TERMINAL
19MM SCAVENGER HOSE (P/N 9995210)
INSPIRATORY VALVE W/22MM BREATHING HOSE TERMINAL
MANUAL/AUTOMATIC SELECTOR VALVE W/22MM HOSE TERMINAL
22MM BREATHING HOSES (P/N 9995132)
SET SCREW (P/N HW10002)
ABSORBER
FRESHGAS LOCKING DEVICE W/15MM FEMALE FITTING
ABSORBER MOUNTING STUD
FRESHGAS HOSE W/15MM MALE FITTING
O-RING (P/N 4105766)
Y-PIECE
BREATHING BAG
SWIVEL BAG MOUNT W/22MM BREATHING BAG TERMINAL
ABSORBER POLE W/19MM SCAVENGER HOSE TERMINALS
SU14718A
TO SCAVENGER
19MM SCAVENGER HOSE (P/N 9995230)

WARNING: To ensure proper direction of gas flow during inspiratory and expiratory phases, the disks in the inspiratory and expiratory valves must move freely, without sticking.

6. Attach a 22 mm breathing hose between the other side of the Y-piece, and the expiratory hose terminal on the ultrasonic flow sensor.

7. Attach the breathing bag to the swivel bag mount 22 mm terminal marked BREATHING BAG.

WARNING: The breathing bag acts as a pressure limiting device during manually assisted and spontaneous ventilation. Therefore, breathing bags used with the Absorber system must comply with the pressure/volume requirements of current ANSI standards. A breathing bag that has been previously stretched may have drastically altered compliance characteristics, and altered conductivity in the case of conductive bags.



Section 3
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8. Connect the 19 mm scavenger hose between the 19 mm terminal marked SCAVENGER HOSE on the bottom of the absorber pole and the 19 mm terminal marked SCAVENGER HOSE on the scavenger.

9. Connect the 19 mm scavenger hose between the 19 mm terminal marked SCAVENGER HOSE on the rear of the APL valve and the 19 mm terminal marked SCAVENGER HOSE on the rear of the absorber pole.

Installing the Breathing Pressure Pilot Line

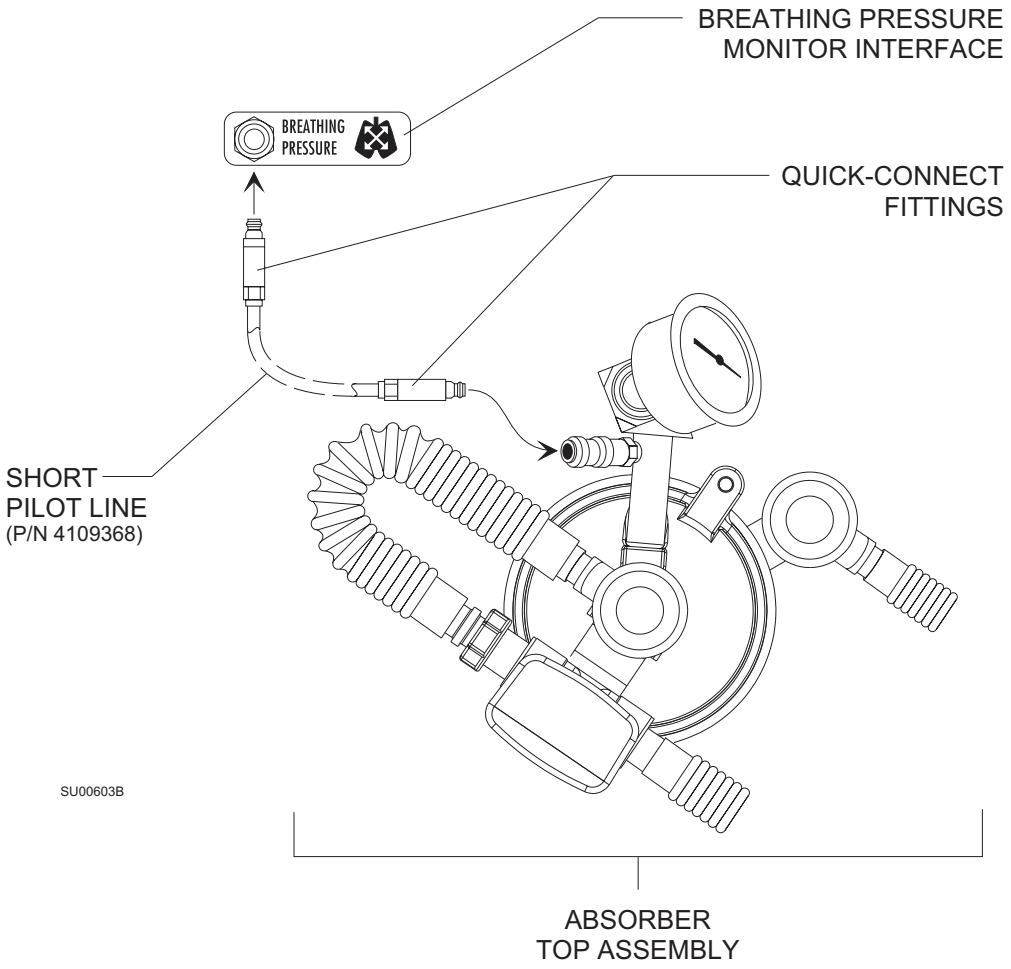
North American Dräger anesthesia systems are supplied with two breathing pressure pilot lines. A shorter one for breathing pressure monitoring at the absorber, and a longer one for breathing pressure monitoring at the Y-piece.

Absorber Monitoring

For breathing pressure monitoring at the absorber, install the shorter pilot line (which has quick-connect fittings on both ends) as follows:

1. Connect one end of the pilot line to the fitting mounted on the rear of the pipe extending from the absorber top assembly.

2. Connect the other end of the pilot line to the breathing pressure monitor interface panel.


BREATHING PRESSURE
MONITOR INTERFACE
BREATHING
PRESSURE
QUICK-CONNECT
FITTINGS
SHORT
PILOT LINE
(P/N 4109368)
SU00603B
ABSORBER
TOP ASSEMBLY

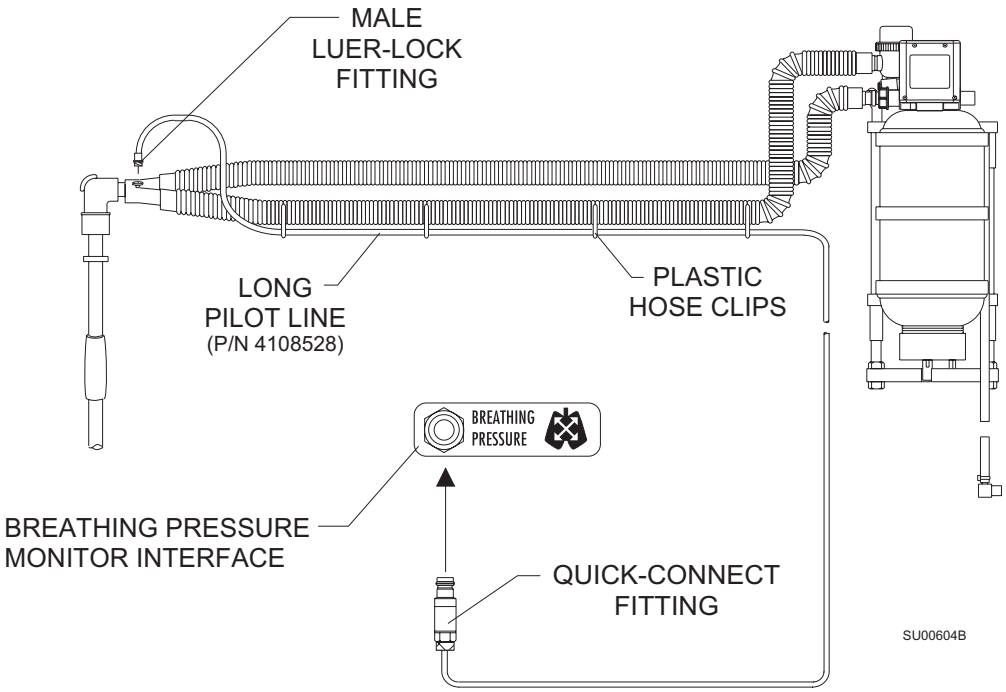
Section 3
Setup and Installation

Y-Piece Monitoring

For breathing pressure monitoring at the patient Y-piece, install the longer pilot line (which has a quick-connect fitting on one end and a Luer type fitting on the other end) as follows:

1. Insert the quick-connect fitting on the pilot line into the breathing pressure monitor interface panel.

2. Connect the Luer fitting on the other end of the pilot line to a Luer fitting on either the patient Y-piece or a 15 mm adapter on the patient side of the Y-piece. Use the four plastic hose clips attached to the pilot line to mount it on either of the breathing hoses leading to the Y-piece.



Installing the Gas Analyzer Sample Line

The illustration shows the components associated with the patient sample line. The following paragraphs describe the installation of each component.

Water Trap Reservoir

Insert the reservoir by guiding its rubber port seals into the ports in the holder on the left side of the monitor box. Gently push at the base of the reservoir until it rests flat against its holder.

Air Filter

Install the Air Filter onto the fitting located to the left of the water trap reservoir, and connect the PVC sample line to the air filter. Each side of the filter has Luer-lock fittings which are secured with a clockwise twist.

Adapter/Filter

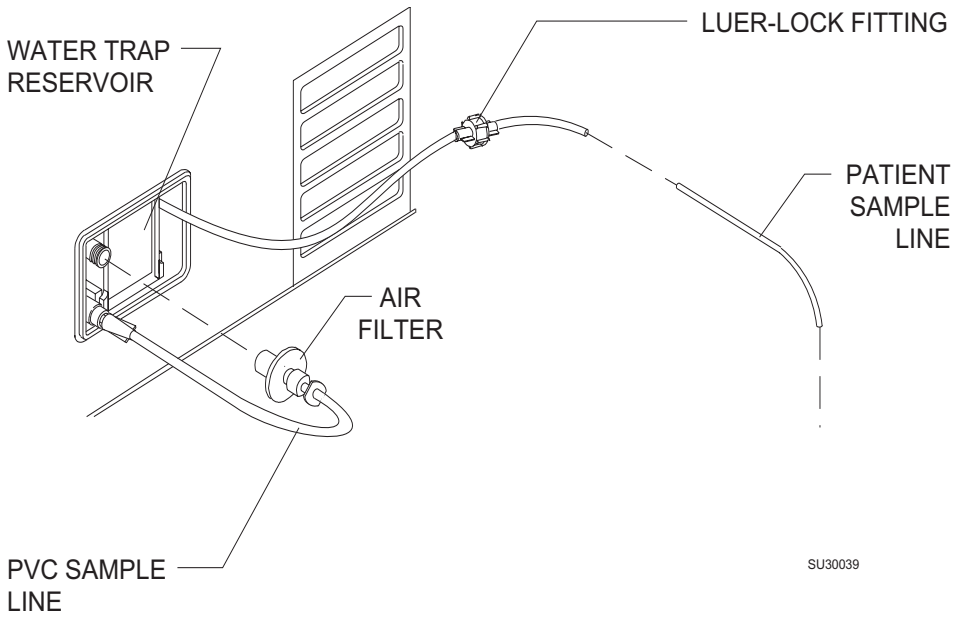
Mount the combination adapter/filter for the sample line between the endotracheal tube (or face mask) and the patient breathing system. This filter is intended to prevent particulate contamination of the sample line.

Patient Sample Line

Install the sample line between the adapter/filter and the water trap reservoir as follows:

1. Insert the male Luer-lock fitting on one end of the line into the female Luer-lock fitting on the adapter/filter. Twist clockwise until secure.

2. Insert the male fitting on the other end of the line into the female fitting attached to water trap reservoir. Twist clockwise until secure. Take care not to kink or pinch the sample line.



Section 3
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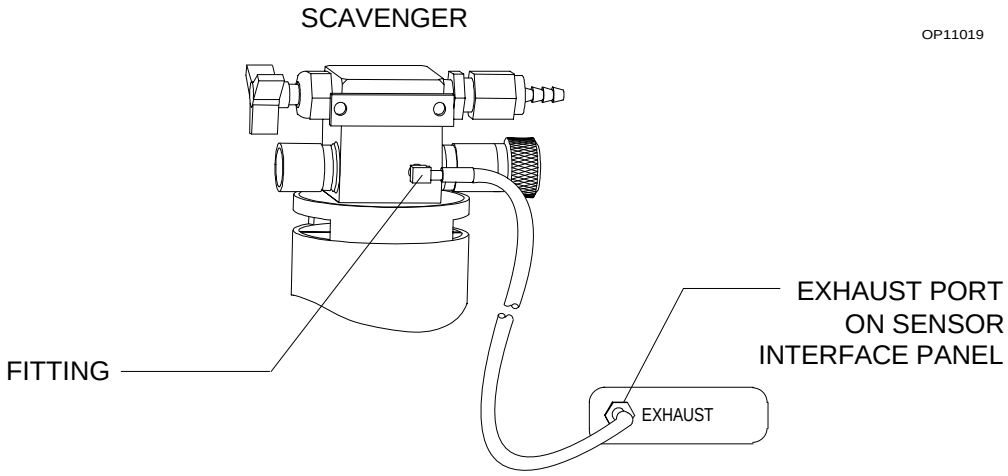
Gas Analyzer Exhaust

Connect the exhaust line between the EXHAUST port on the sensor interface panel, and the small hose barb fitting on the scavenger.

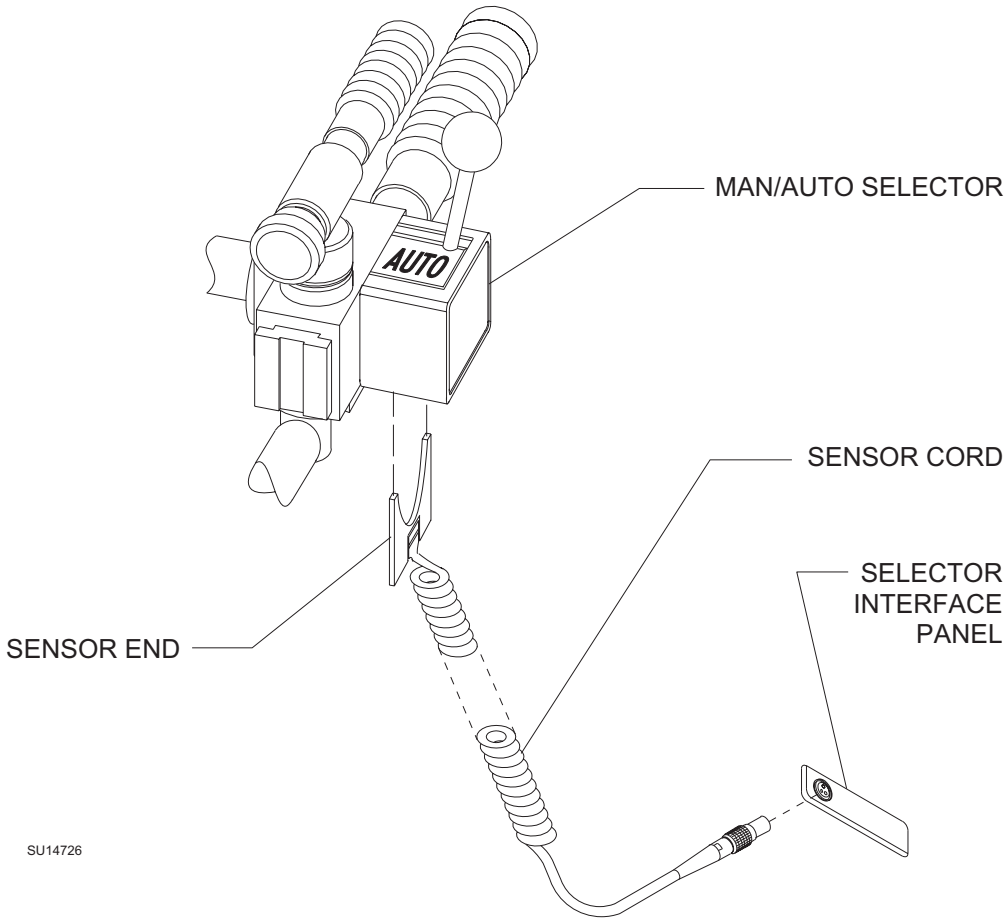


If a passive scavenger system is being used, install a hose barb adapter on one of the scavenger's 19 mm terminals and connect the gas analyzer exhaust line to the hose barb.

Installing the AUTO/BAG Sensor Cord

1. Insert the sensor end of the sensor cord into the underside of the Man/Auto selector housing. Note that the sensor is keyed and will only fit into the selector housing one way. Push the sensor into the selector housing until it snaps into place.

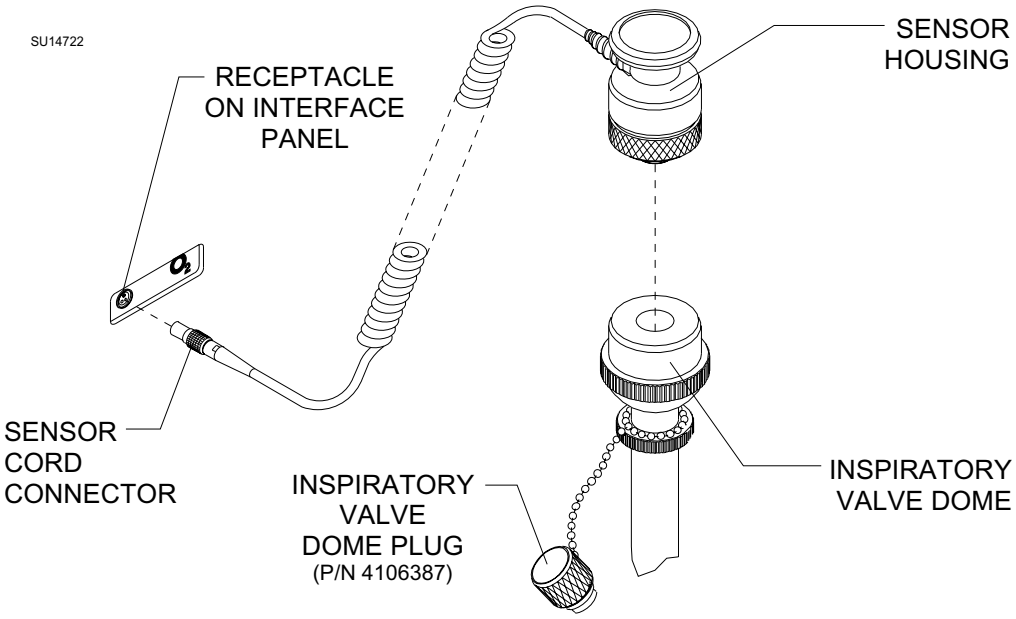
2. Plug the other end of the sensor cord into the receptacle on the SELECTOR interface panel on the machine. Align the key on the connector with the keyway on the receptacle, and push the connector in until it snaps into place.



Section 3
Setup and Installation

Installing the Oxygen Sensor

1. Remove the inspiratory valve dome plug from the inspiratory valve dome.
2. Connect the sensor cord to the receptacle on the O_2 sensor interface panel.
3. Remove any protective covering from the sensor housing.
4. Perform an oxygen sensor calibration as described in *Operation - Oxygen Monitoring* in the *Narkomed 4 Operator's Manual.*
5. Insert the sensor assembly into the inspiratory valve dome by pressing it into place.

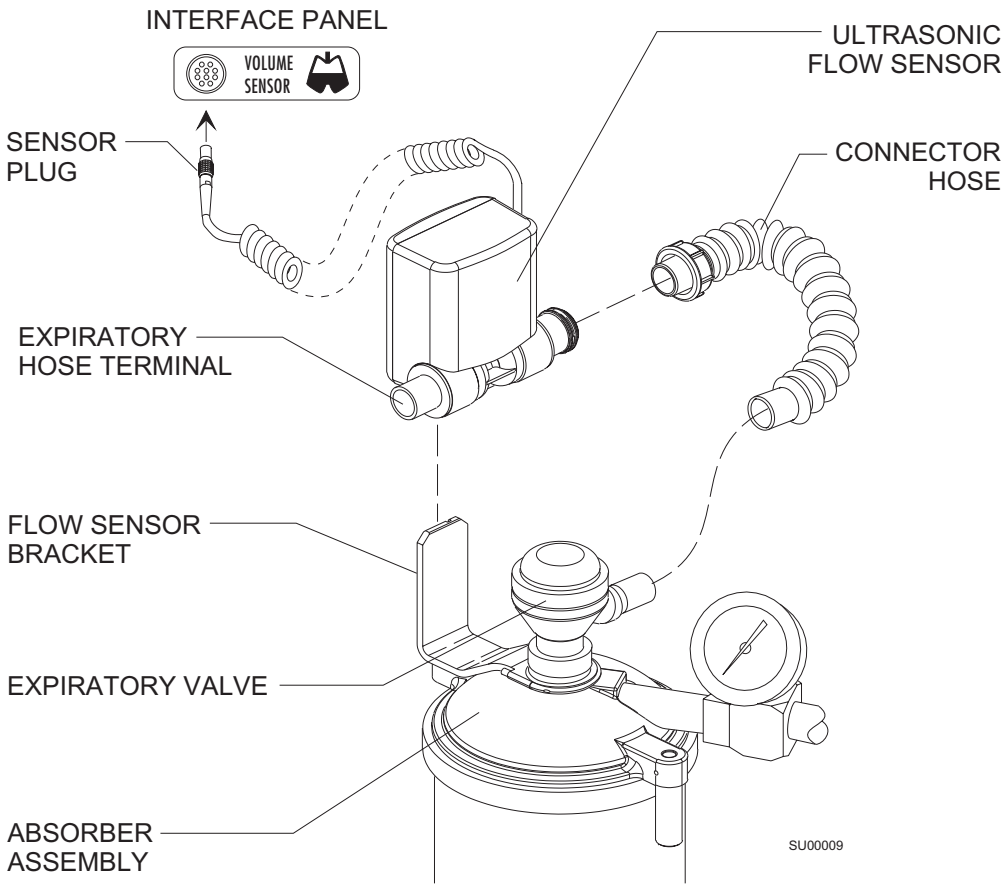


Installing the Ultrasonic Flow Sensor

1. Slide the flow sensor down onto the bracket attached to the expiratory valve mount.

2. Install the connector hose on the threaded port of the flow sensor, and join the other end of the hose to the expiratory valve. Ensure that the expiratory valve is oriented as shown in the illustration below.

3. Connect the sensor plug to the VOLUME SENSOR interface.



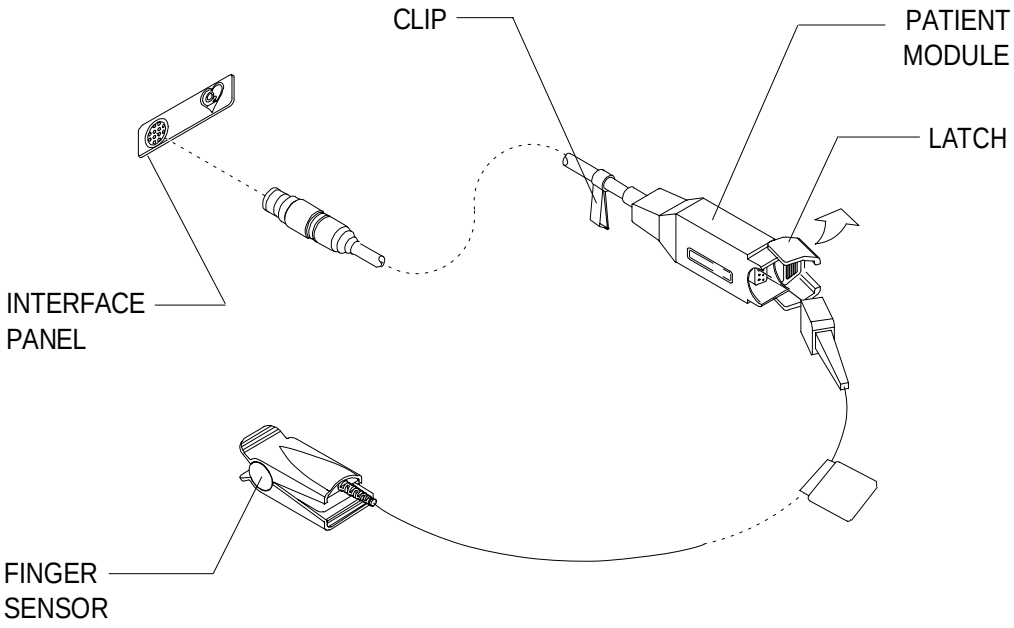
Section 3
Setup and Installation

Installing the Oximeter Sensor

1. Attach the patient module cable to the interface panel by aligning the red dots and inserting the cable connector into the panel socket.

2. Insert the sensor connector into the patient module socket and latch it into place.

3. Fasten the patient module to a sheet or similar article using the clip attached to the cable.



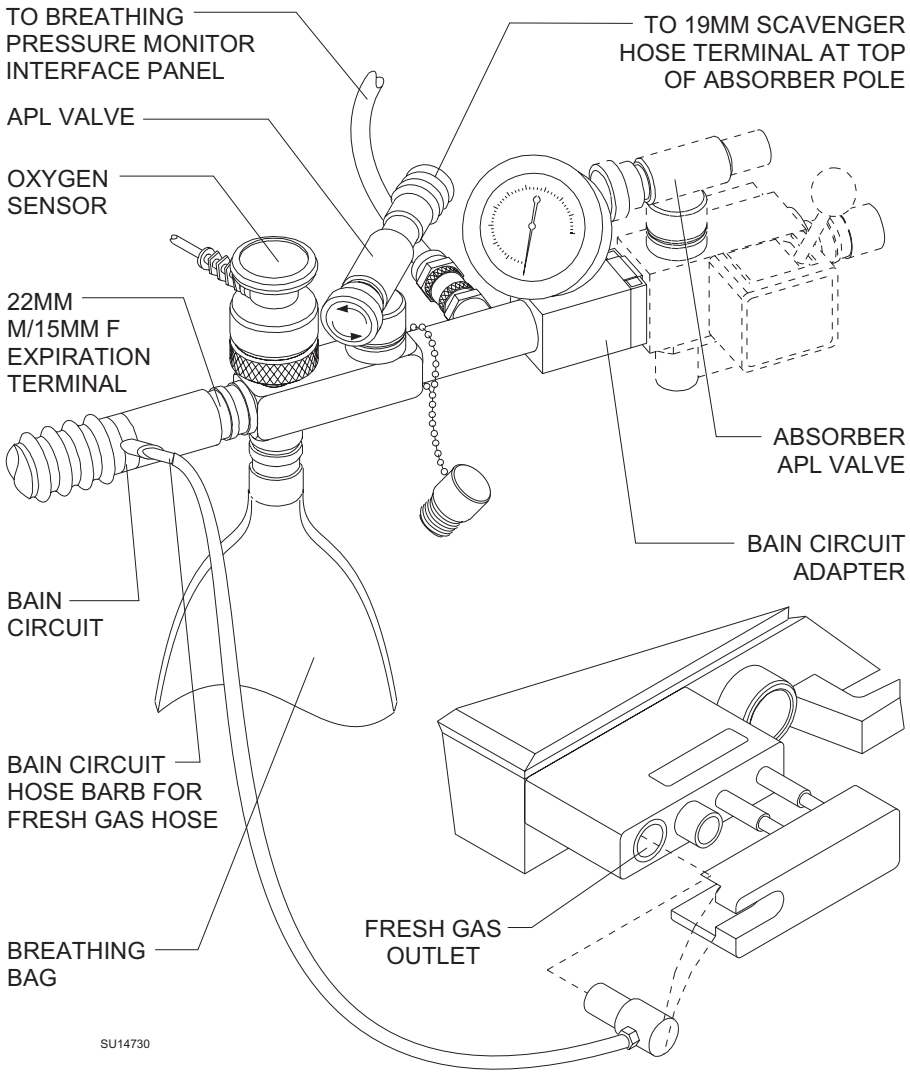
Installing the Bain Circuit Adapter (Optional)

Two types of Bain Circuit adapters are available. One mounts to the absorber; the other mounts to the absorber pole.

Absorber Mount Bain Circuit Adapter

To install the absorber mount Bain Circuit Adapter, slip the mounting bracket of the Bain Circuit Adapter down over the slide mount on the absorber assembly (on the block below the APL valve).

WARNING: To avoid confusion between hose terminals on the absorber system and the Bain Circuit Adapter, always remove the Bain Circuit Adapter from the absorber mount when the Bain Circuit Adapter is not in use.



Section 3
Setup and Installation

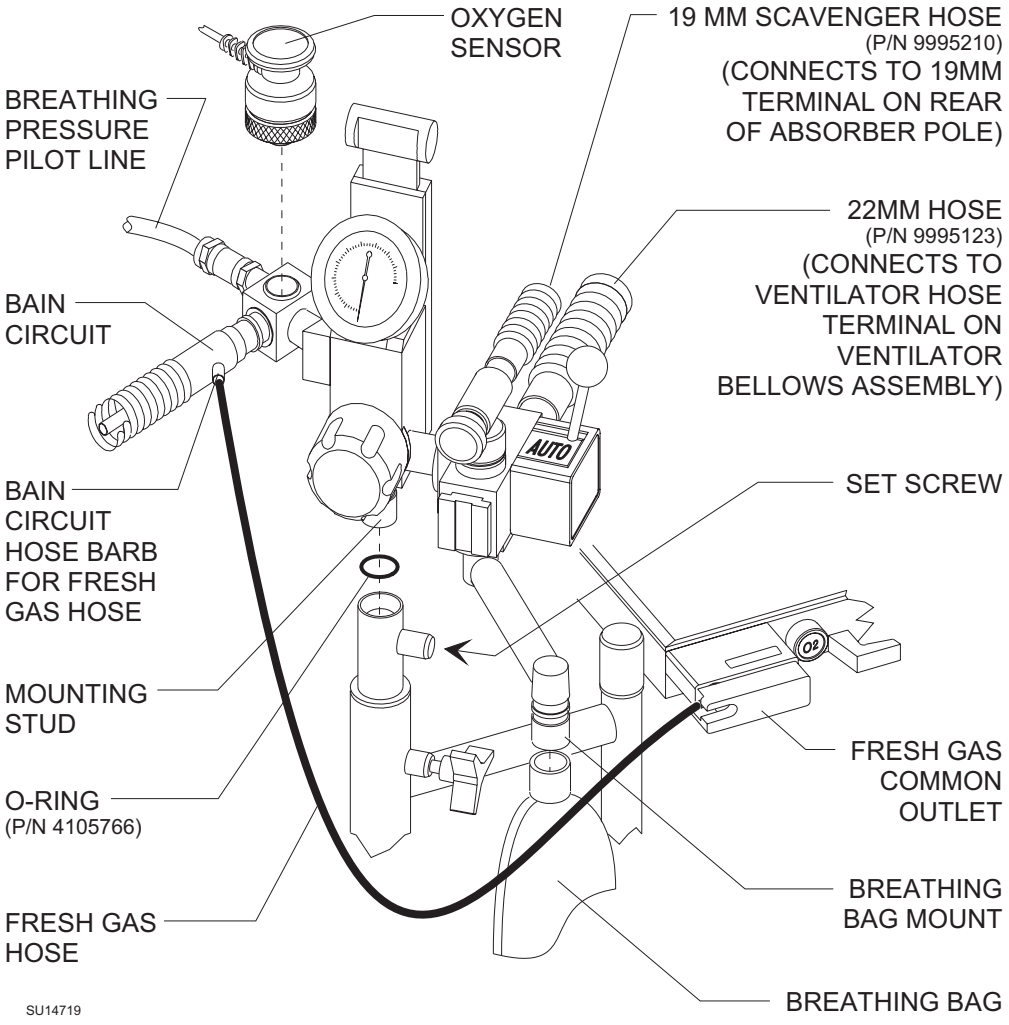
Pole Mount Bain Circuit Adapter with PEEP and/or Manual/ Automatic Selector Valves

To install Bain Circuit Adapters with PEEP and/or manual/automatic selector valves:

1. Loosen the set screw on the absorber pole and remove the absorber system (if the machine is so equipped).

2. Slip the Bain Circuit Adapter mounting stud into the absorber pole on the swivel arm. Be sure that the O-ring is in place on the mounting stud.

3. Tighten the set screw on the absorber pole to lock the Bain Circuit Adapter in place.


OXYGEN SENSOR
19 MM SCAVENGER HOSE (P/N 9995210) (CONNECTS TO 19MM TERMINAL ON REAR OF ABSORBER POLE)
BREATHING PRESSURE PILOT LINE
22MM HOSE (P/N 9995123) (CONNECTS TO VENTILATOR HOSE TERMINAL ON VENTILATOR BELLOWS ASSEMBLY)
BAIN CIRCUIT
AUTO
SET SCREW
BAIN CIRCUIT HOSE BARB FOR FRESH GAS HOSE
MOUNTING STUD
O2
FRESH GAS COMMON OUTLET
O-RING (P/N 4105766)
BREATHING BAG MOUNT
FRESH GAS HOSE
BREATHING BAG
SU14719

Bain Circuit Oxygen Sensor Installation

1. Insert the oxygen sensor into the port adjacent to the expiratory terminal. When the port is not in use, close it with the provided plug. Connect the sensor cable to the sensor interface panel as described earlier in this section.

WARNING: A functioning oxygen analyzer must always be used with the Bain Circuit Adapter.

2. Connect the breathing pressure pilot line to the quick-connect fitting on the bain circuit adapter. Connect the other end of the pilot line to the sensor interface panel as described earlier in this section.

WARNING: A functioning breathing pressure monitor must always be used with the Bain Circuit Adapter.

Bain Circuit Connections

1. Install the breathing bag onto the terminal labeled BREATHING BAG.

WARNING: Breathing bags attached to the Bain Circuit Adapter's 22 mm terminals must comply with current ANSI standards.

2. Connect the 19 mm scavenger hose between the 19 mm terminal at the rear of the APL valve marked SCAVENGER HOSE and the 19 mm terminal on the rear of the absorber pole marked SCAVENGER HOSE.

3. If applicable, connect a 22 mm hose between the terminal on the rear of the manual/automatic selector valve, and the VENTILATOR HOSE terminal on the bottom of the ventilator bellows assembly.

WARNING: Hoses connected to the Bain Circuit Adapter terminals must comply with current ANSI standards.

4. Connect the Bain Circuit to the 22 mm male/15 mm female terminal on the Bain Circuit Adapter marked EXPIRATION.

5. Connect the fresh gas hose between the fresh gas outlet on the NARKOMED 4, and the hose barb fitting on the Bain Circuit (inner tube connection).

6. Set the APL valve fully open, set the PEEP at minimum (if so equipped), and set the Man/Auto selector to BAG.

WARNING: The fresh gas hose must not be pinched or kinked.

Section 3
Setup and Installation

Installing the Fresh Gas Oxygen Sensor Adapter (Optional)

1. Hold the locking bar on the anesthesia machine's fresh gas outlet in the extended position.

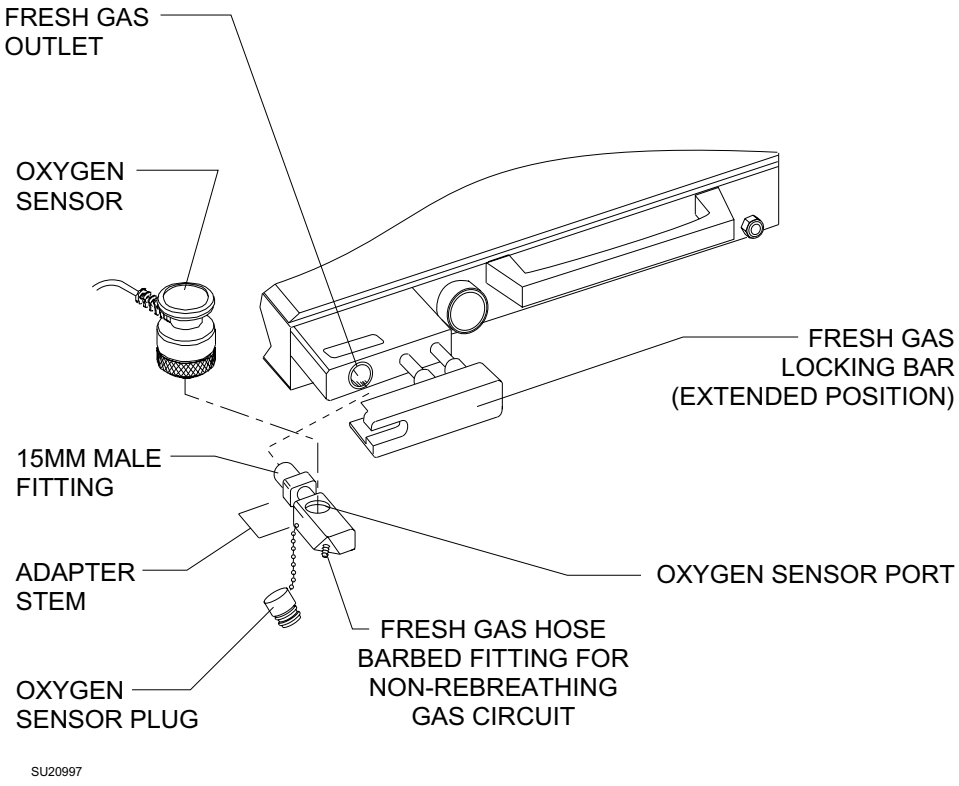
2. With the oxygen sensor port facing up, slide the notched portion of the adapter stem into the retaining slot of the locking bar, so that the adapter's 15 mm male fitting faces the anesthesia machine's fresh gas outlet.

3. Release the locking bar, guiding the adapter's 15 mm male fitting into the fresh gas outlet of the anesthesia machine.

4. Insert the oxygen sensor into the port on top of the adapter.

WARNING: If the oxygen sensor is removed, the oxygen sensor port must be closed with the oxygen sensor port plug.

5. Attach the non-rebreathing circuit fresh gas hose to the adapter's barbed fitting. (For non-rebreathing circuits equipped with a 15 mm fresh gas connector, cut off the connector and press the hose onto the barbed fitting of the adapter.)

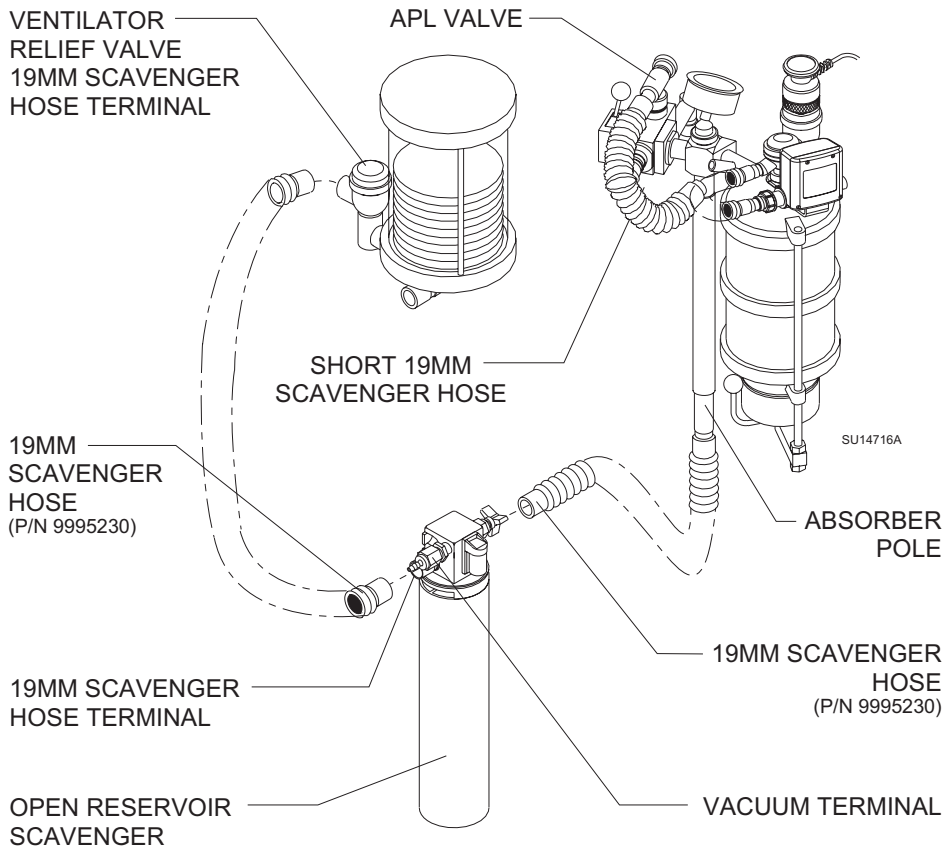


Connecting the Open Reservoir Scavenger System (Optional)

The Open Reservoir Scavenger is installed on the NARKOMED 4 before shipping. The scavenger hose connections are described below.

CAUTION: Take special care not to accidentally force 19 mm scavenger hoses over 22 mm breathing hose terminals. Carefully follow the hose connection instructions for installing the scavenger and the absorber.

1. Connect a 19 mm scavenger hose between the 19 mm terminal (marked SCAVENGER HOSE) on the bottom of the absorber pole and the 19 mm terminal (marked SCAVENGER HOSE) on the right side of the scavenger.



WARNING: The 19 mm scavenger hoses leading from the absorber must not be pinched, kinked, or blocked in any manner.

2. Connect the short 19 mm scavenger hose between the 19 mm terminal (marked SCAVENGER HOSE) on the rear of the APL valve and the 19 mm terminal (marked SCAVENGER HOSE) on the rear of the absorber pole.

3. Connect another 19 mm scavenger hose between the 19 mm terminal (marked SCAVENGER HOSE) on the ventilator relief valve and the 19 mm terminal (marked SCAVENGER HOSE) on the left side of the scavenger.

WARNING: The 19 mm scavenger hose leading from the ventilator relief valve must not be pinched, kinked, or blocked in any manner.

4. Connect a wall suction hose between the wall suction outlet and the suction terminal (DISS fitting or hose barb with adapter) on the scavenger.

Connecting the Scavenger Interface for Passive Systems (Optional)

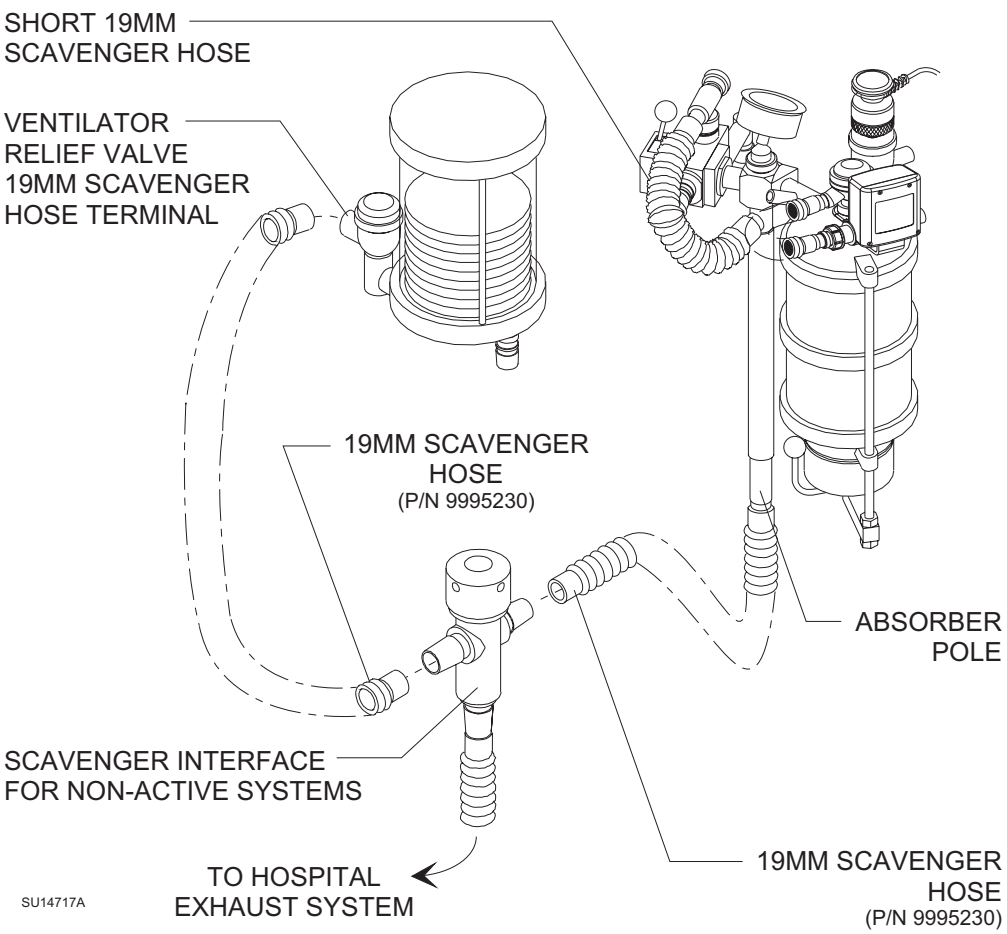
The Scavenger Interface for Passive Systems is installed on the NARKOMED 4 before shipping. The scavenger hose connections are described below.

CAUTION: Take special care not to accidentally force 19 mm scavenger hoses over 22 mm breathing hose terminals. Carefully follow the hose connection instructions for installing the scavenger and the absorber.

1. Connect a 19 mm scavenger hose between the 19 mm terminal (marked SCAVENGER HOSE) on the bottom of the absorber pole and the 19 mm terminal (marked SCAVENGER HOSE) on the right side of the scavenger.

WARNING: The 19 mm scavenger hoses leading from the absorber must not be pinched, kinked, or blocked in any manner.

2. Connect the short 19 mm scavenger hose between the 19 mm terminal (marked SCAVENGER HOSE) on the rear of the APL valve and the 19 mm terminal (marked SCAVENGER HOSE) on the rear of the absorber pole.



3. Connect another 19 mm scavenger hose between the 19 mm terminal (marked SCAVENGER HOSE) on the ventilator relief valve and the 19 mm terminal (marked SCAVENGER HOSE) on the left side of the scavenger.

WARNING: The 19 mm scavenger hose leading from the ventilator relief valve must not be pinched, kinked, or blocked in any manner.

NOTE: If only one of the 19 mm hose terminals will be used, the unused terminal should be capped with the provided input port cap.

4. Connect another 19 mm scavenger hose between the vertical 19 mm terminal labeled EXHAUST (on the bottom of the scavenger) and the hospital exhaust system grill adapter.

Section 3
Setup and Installation

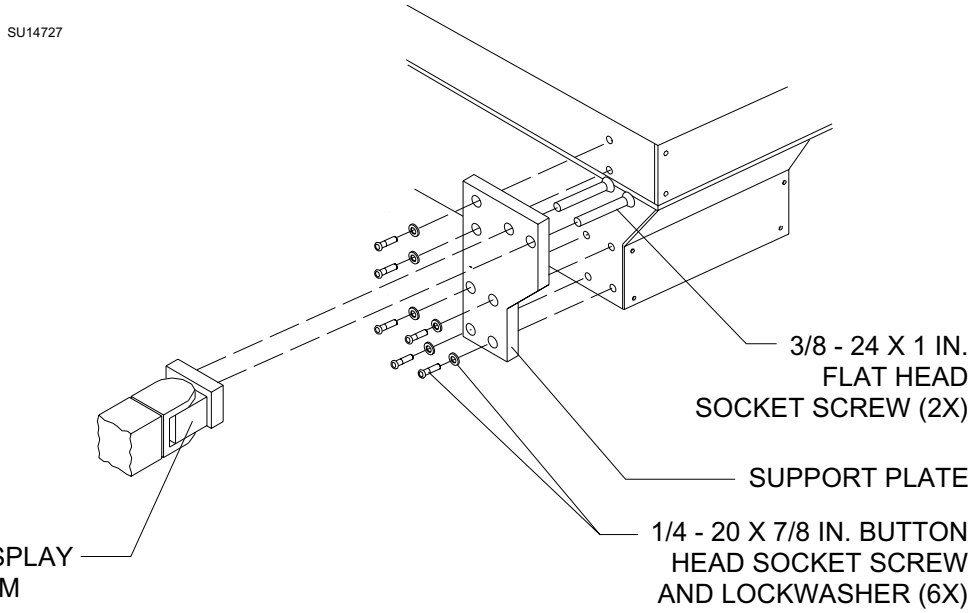
Installing the Display Arm on the Machine

NOTE: The following instructions apply to installations with either an adjustable display arm or a short display arm.

NOTE: If the installation includes an optional patient line boom arm, skip to the next page.

1. If the display arm was not pre-assembled to the support plate,attach the display arm to the support plate with two ⅜-24 x 1 in. flat head socket screws.

2. Position the display arm and support plate assembly at the left side of the machine and attach the support plate to the machine with six ¼-20 x ⅞ in. button head socket screws and lock washers. If the machine was ordered with a manual sphygmomanometer, use a ¼-20 x 1⅜ in. button head socket screw through the gauge mount at the lower front corner of the support plate.

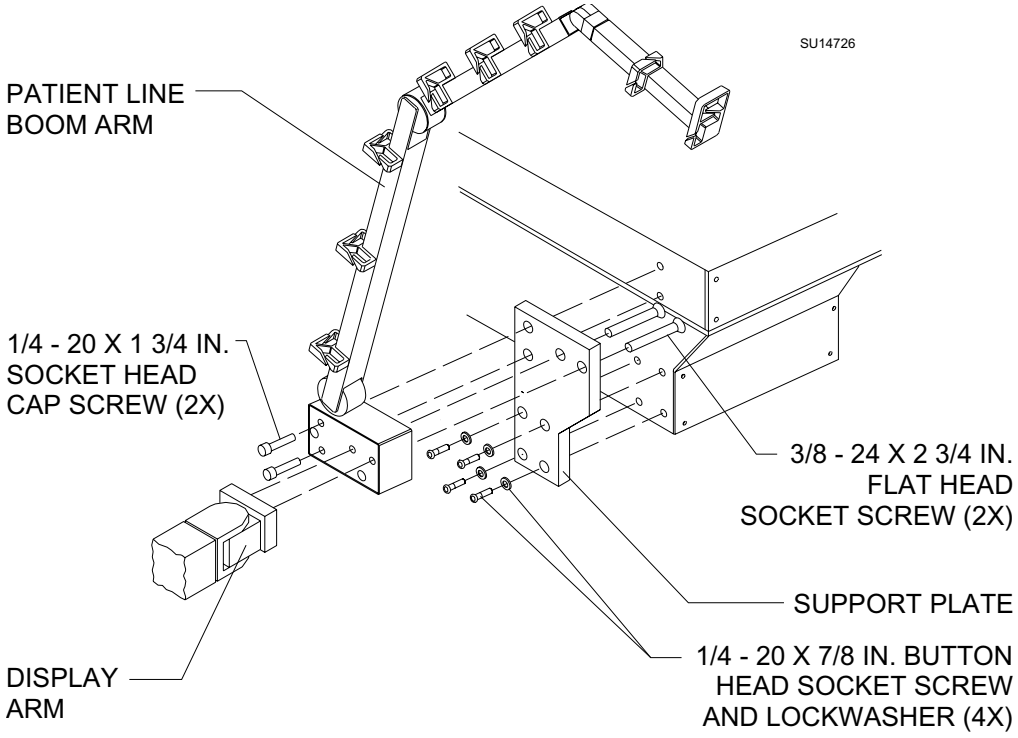


Installing the Display Arm with the optional Patient Line Boom Arm

1. Assemble the display arm, patient line boom arm, and support plate as illustrated, with two ⅜-24 x 2¾ in. flat head socket screws.

2. Position the assembly at the left side of the machine, and attach the support plate to the machine with four ¼-20 x ⅞ in. button head socket screws and lock washers. If the machine was ordered with a manual sphygmomanometer, use a ¼-20 x 1⅜ in. button head socket screw through the gauge mount at the lower front corner of the support plate.

3. Install two ¼-20 x 1¾ in socket head cap screws through the patient line boom arm block and support plate into the machine.


SU14726
PATIENT LINE BOOM ARM
1/4 - 20 X 1 3/4 IN. SOCKET HEAD CAP SCREW (2X)
DISPLAY ARM
3/8 - 24 X 2 3/4 IN. FLAT HEAD SOCKET SCREW (2X)
SUPPORT PLATE
1/4 - 20 X 7/8 IN. BUTTON HEAD SOCKET SCREW AND LOCKWASHER (4X)

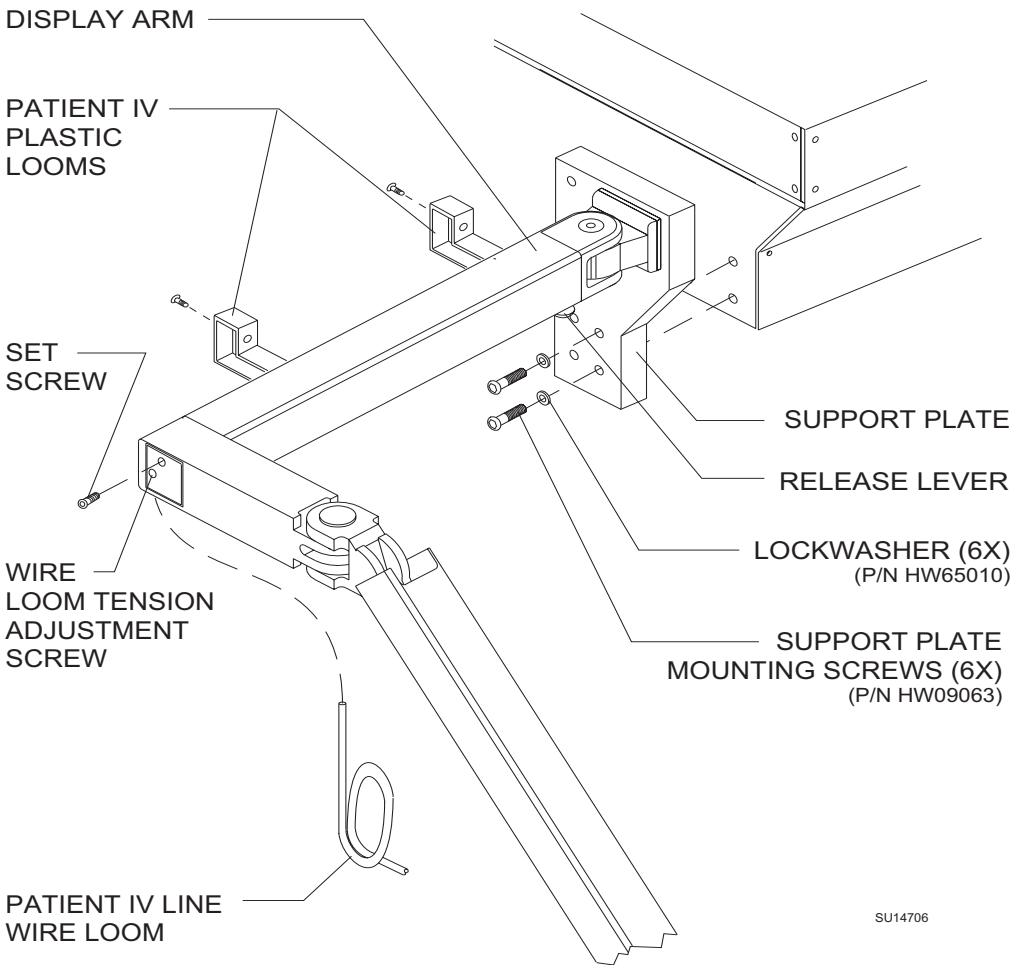
Section 3
Setup and Installation

Installing the Display Arm Hardware
(Adjustable Display Arm)

1. If the patient IV line plastic looms are not pre-assembled to the display arm, attach each one to the side of the arm with a 6-32 x ⅜ in. buttton head socket screw. The approximate locations are shown in the illustration. (An additional mounting screw will be installed through the bottom of each loom when the Datagrip and display cables are installed.)

2. Insert the patient IV line wire loom up into the display arm elbow as shown in the illustration. While holding the wire loom, insert a 6-32 x ½ in. flat point set screw through the access hole in the end of the wire loom block and thread the set screw into the wire loom (turn the wire loom as needed to align its tapped hole with the access hole in the block). Verify that the wire loom can easily be rotated 360° on its axis.

3. If necessary, tighten the wire loom tension screw until the wire loom turns with the desired amount of friction.



Installing the Datagrip and Display Assembly

1. Remove the plastic cap at the end of the display arm to expose the Datagrip assembly mounting screw. Position the Datagrip assembly under the boom arm and thread the mounting screw into the Datagrip mounting block; the correct arrangement of the mounting hardware is shown in the illustration. Be sure that the delrin spacer is installed between the Datagrip mounting block and the display arm.

2. Tighten the mounting screw to a torque of 4 foot pounds. Reinstall the plastic cap to cover the mounting screw recess.

Installing the Datagrip and Display Cables (Adjustable Display Arm)

1. Install the Datagrip and display cables in the three cable clamps on the underside of the display arm as shown in the illustration. Secure each clamp with a 6-32 x ⅜ in. button head socket screw.

2. Slide the cables under the patient IV line plastic looms and install a 6-32 x ⅜ in. button head socket screw through each loom into the display arm.

3. Route the cables through a ¾ in. cable clamp at the support plate and secure the clamp with a 6-32 x ⅜ in. button head socket screw.

4. Connect the Datagrip and display cables to their receptacles on the monitor interface panel.

5. Pull the release lever and verify that the display arm has full range of motion with no binding caused by the cables. Position the cables in their clamps as needed. Coil any excess cable in the lower part of the plastic looms.

Installing the Datagrip and Display Cables (Short Display Arm)

1. Route the Datagrip and display cables through the ⅜ in. cable clamp on the bottom of the short arm as shown in the illustration. Ssecure the clamp with a 6-32 x ⅜ in. button head socket screw.

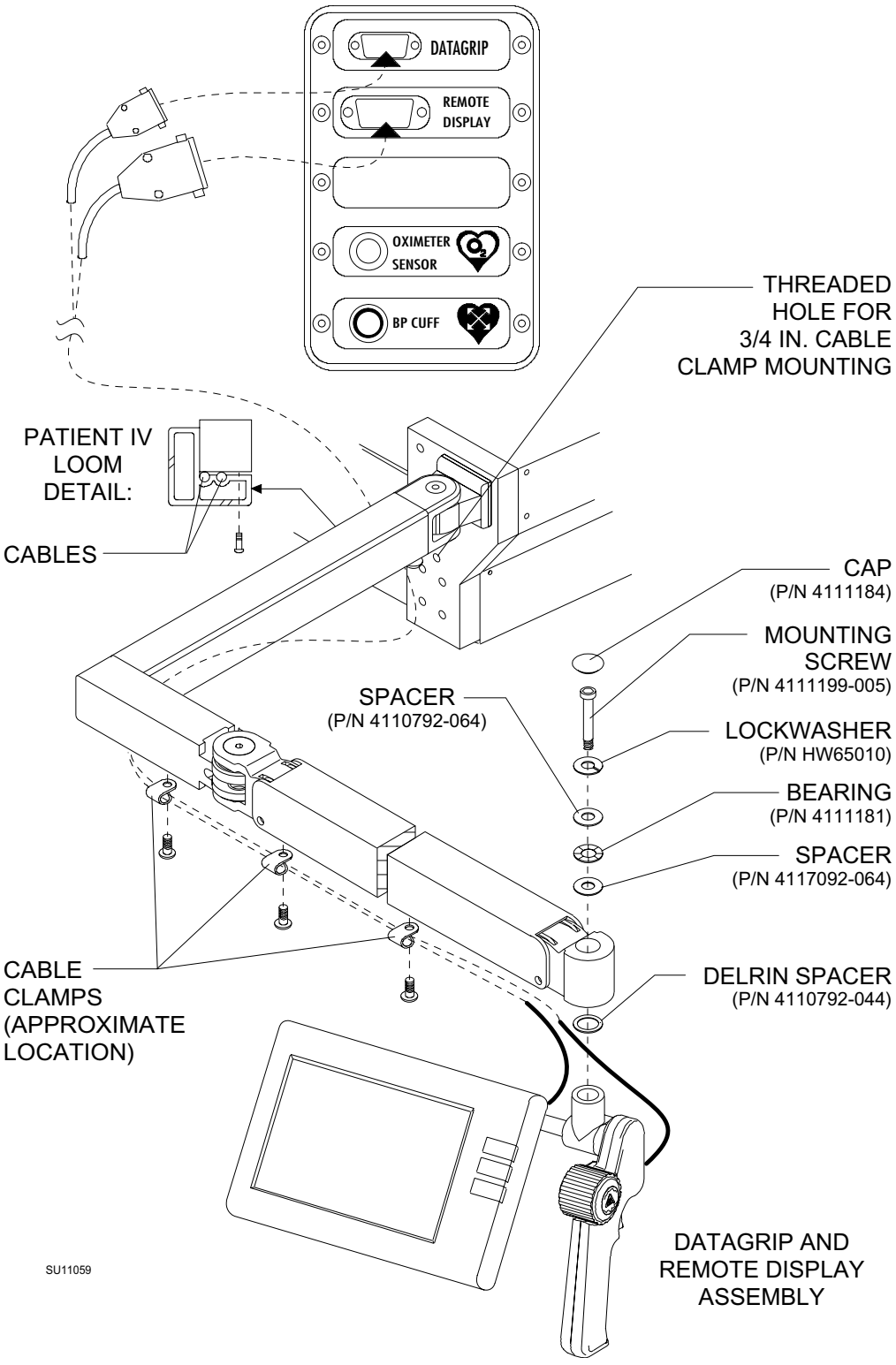
2. Route the cables through a ¾ in. cable clamp at the support plate and secure the clamp with a 6-32 x ⅜ in. button head socket screw.

3. Verify that the Datagrip, the display, and the short arm have full range of adjustment with no binding caused by the cables. Position the cables in their clamps as needed.

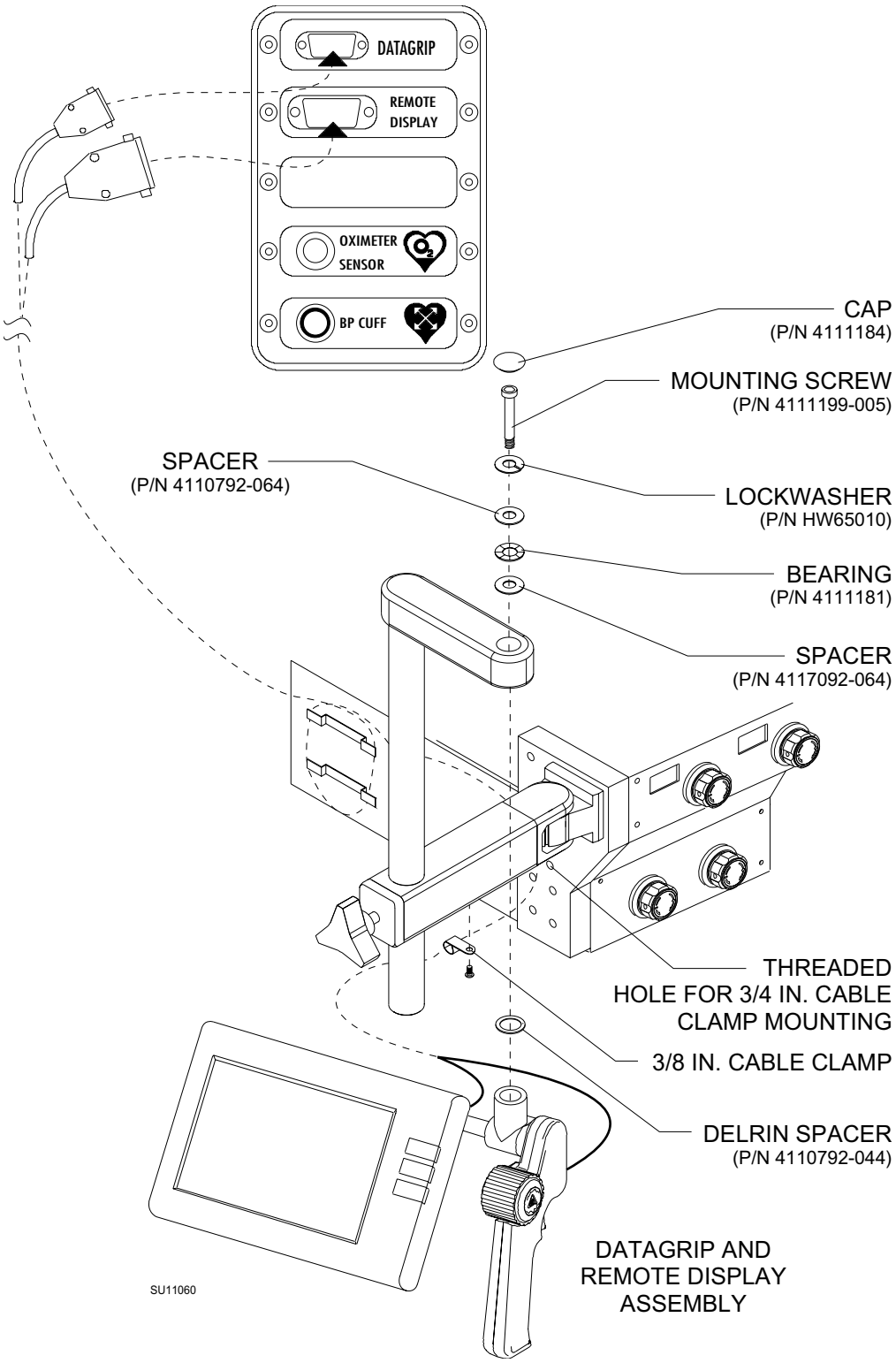
4. Coil the excess cable around the cord-wraps on the side of the bellows box, and connect the cables to their receptacles on the monitor interface panel.

Section 3
Setup and Installation

Adjustable Display Arm



Short Display Arm



Section 3
Setup and Installation

Installing the Manual Sphygmomanometer Gauge (Optional)

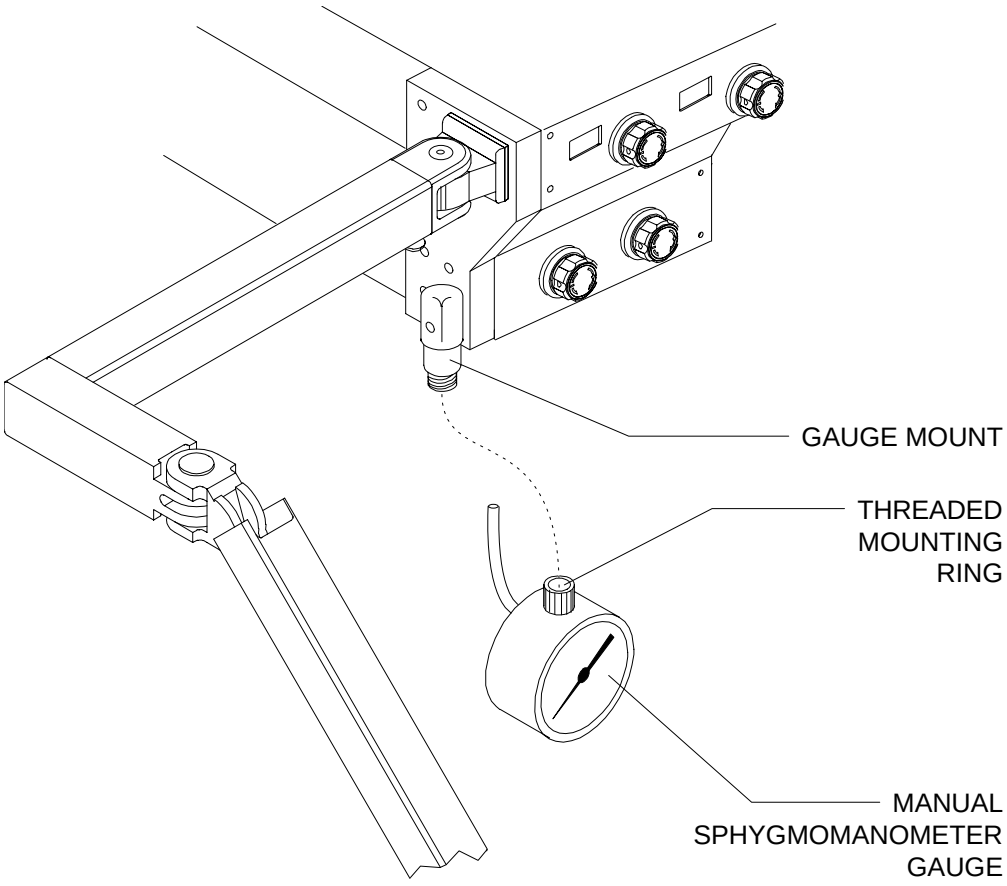
1. Remove the protective cap covering the threads of the gauge mount, located at the boom arm support plate on the left side of the anesthesia machine.

2. Screw the manual sphygmomanometer gauge mounting ring tightly onto the gauge mount, oriented with the gauge facing forward.

3. Connect the gauge hose to the BP GAUGE fitting on the interface panel.

4. Connect the cuff extension hose to the BP CUFF fitting on the interface panel. Connect the other end of the cuff extension hose to a blood pressure cuff. Refer to the *Narkomed 4 Operator's Instruction Manual* for selecting the correct size blood pressure cuff.

5. Connect an inflation bulb to the female luer fitting labeled BP BULB on the front of the machine.



SU14705

Installing the Auxiliary Lamp (Optional)

1. From the auxiliary lamp assembly, remove the two hex standoffs. (Each standoff is secured by an 8-32 x ¼ in. button head screw through the outside of the lamp housing.)

2. Thread the two hex standoffs into tapped holes on the ventilator box as shown in the illustration, and tighten each standoff.

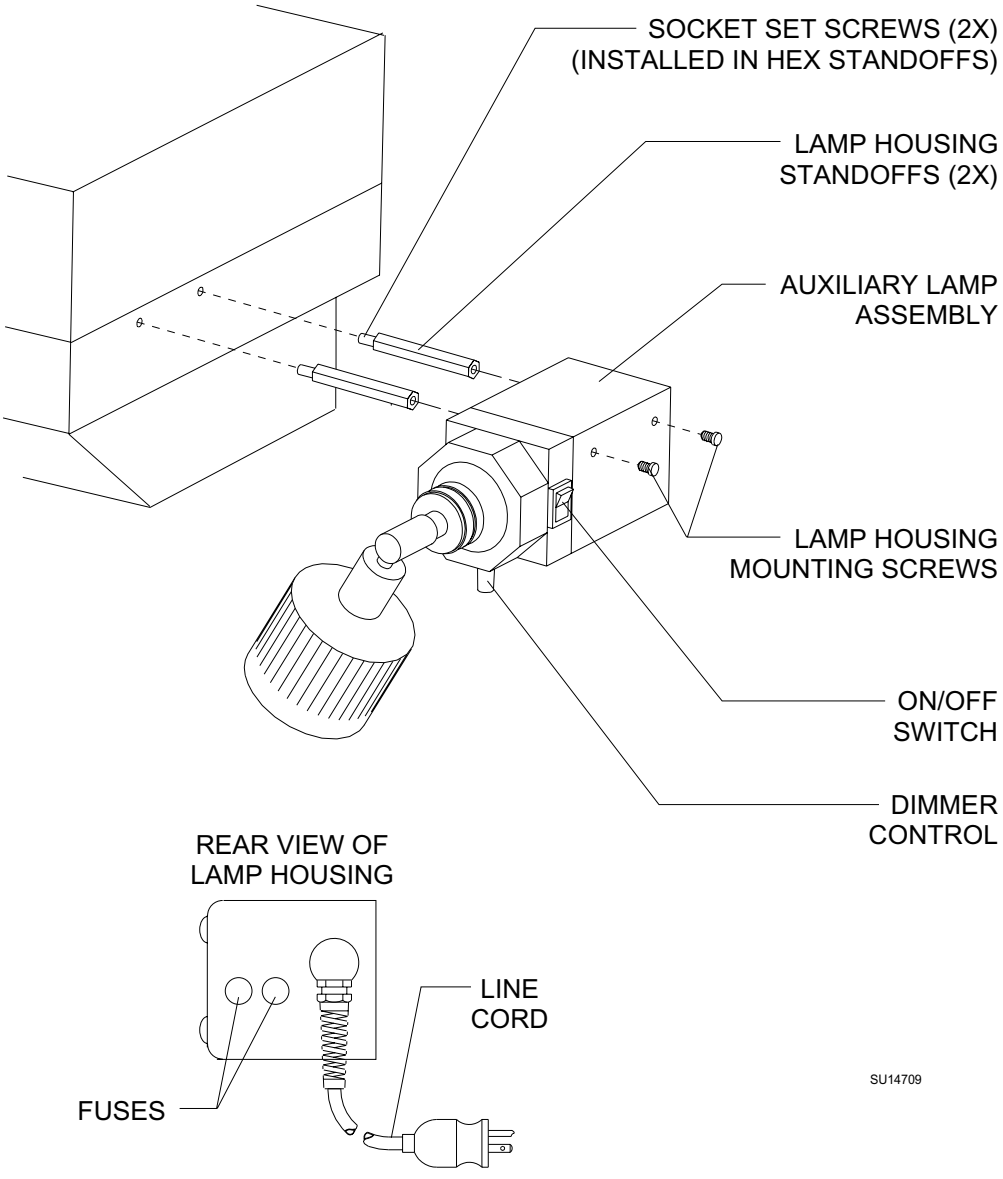
3. Install the auxiliary lamp housing over the standoffs, and secure the lamp housing to the machine with the two button head screws that were previously removed.

4. Verify that each fuse holder on the back of the lamp housing contains a 250V, 0.5A slow blow fuse (P/N 4112074-001).

5. Connect the auxiliary lamp line cord to one of the convenience outlets on the rear of the machine.

6. Verify that the lamp ON-OFF switch and dimmer control are working properly after the machine is connected to AC power.

Section 3
Setup and Installation

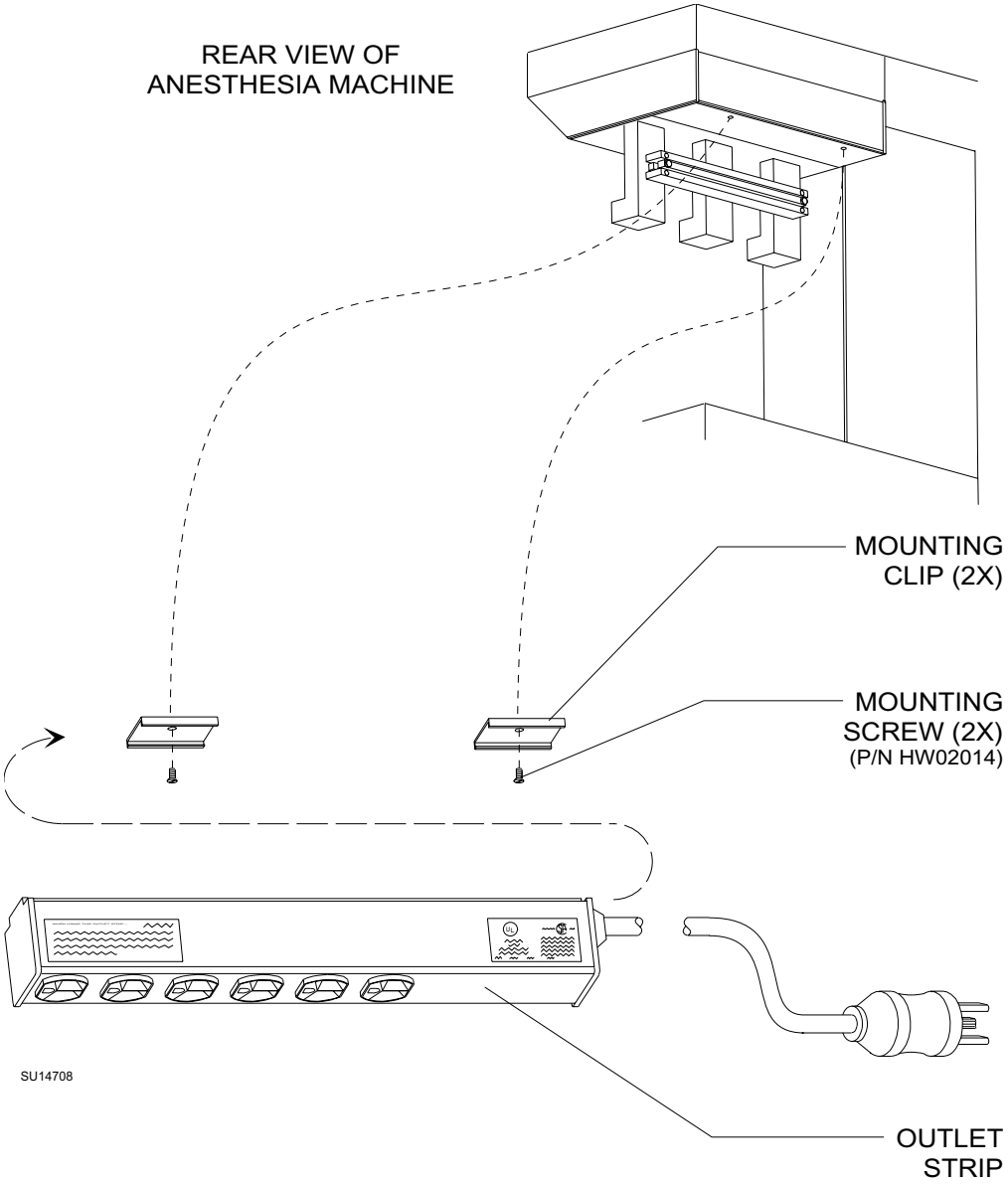


Installing the Outlet Strip (Optional)

1. Fasten the two outlet strip mounting clips to the vapor box bottom access plate with 8-32 x ¼ in. pan head screws.

2. Slide the outlet strip onto the mounting clips. Be sure that the clips engage both mounting rails on the outlet strip housing.

3. Connect the outlet strip power cord to a hospital grade outlet only. DO NOT connect the power cord to the convenience receptacles on the anesthesia machine.

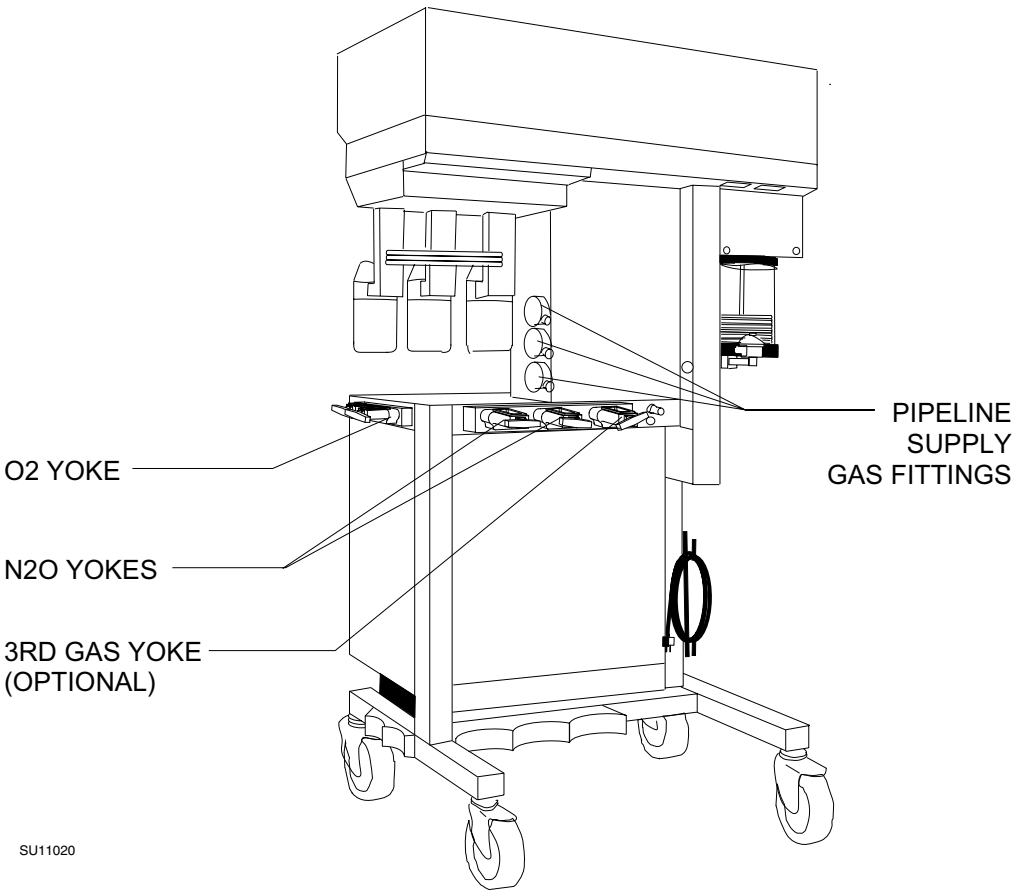


RETURN TO THIS MANUAL'S TABLE OF CONTENTS
RETURN TO CD-ROM TABLE OF CONTENTS

Section 4
Gas Supply Connections

Gas Supply Connections

The location of the gas supply connections on the NARKOMED 4 Anesthesia Machine is shown in the illustration. Details of the cylinder yokes and the pipeline connections are given in the following paragraphs.



Connecting the Cylinders

The NARKOMED 4 is equipped with ANSI standard pin-indexed hanger yokes for E-size gas cylinders.

WARNING: Oil and grease may combine explosively with oxygen or nitrous oxide. For this reason, oil and grease must never come in contact with pipelines, cylinders, cylinder valves, gauges, fittings, etc., which conduct oxygen or nitrous oxide within the machine. For further information regarding safety precautions in the use of medical gases, consult Compressed Gas Association pamphlet P-2 and appropriate sections of National Fire Protection Association Standard 99.

Section 4
Gas Supply Connections

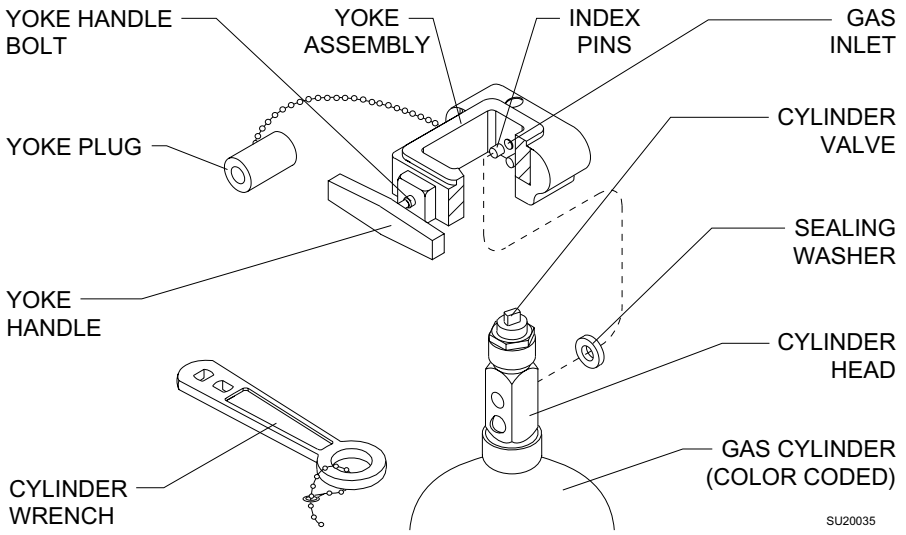
Attach cylinders as follows:

1. Place a new washer on the seat of the yoke gas inlet connection.

WARNING: Use only one cylinder washer per yoke. Using more than one washer could cause leakage of the cylinder gas and compromise the pin indexing system.

2. Verify the presence and integrity of the two index pins below the gas inlet.

WARNING: Check cylinder yokes for the presence of two index pins each time a cylinder is attached to the machine.



3. Insert the head of a gas cylinder with matching gas into the yoke from below, so that the gas outlet and indexing holes on the cylinder head are facing the gas inlet and indexing pins on the yoke assembly.

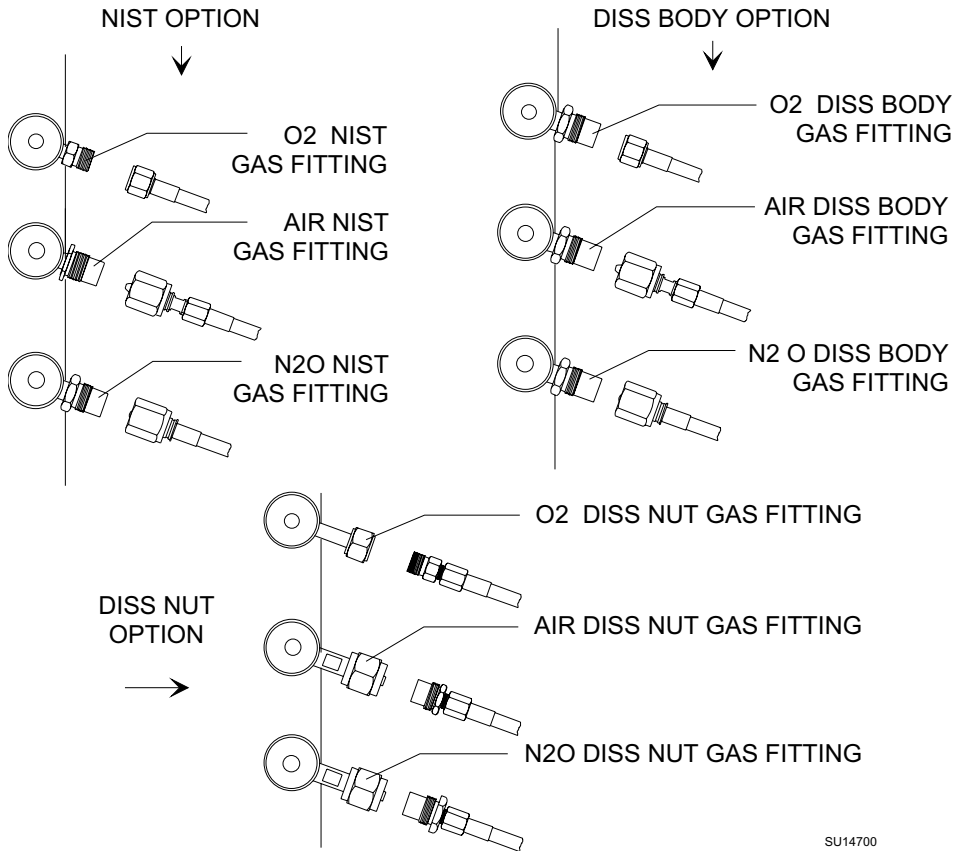
4. Engage the indexing holes with the index pins. Screw the yoke handle clockwise against the cylinder head, so that the point of the yoke handle bolt is aligned with the countersunk recess on the back of the cylinder head.

5. Verify that the sealing washer is in place, that the index pins are engaged, and that the cylinder hangs vertically. Tighten the handle securely.

Section 4
Gas Supply Connections

Connecting the Pipelines

Pipeline connections for oxygen, nitrous oxide and an optional third gas are located on the side of the flowmeter housing. The pipeline inlets are marked with color-coded labels for each gas. Several pipeline fitting styles are illustrated, and the table below lists the gas system color coding.


NIST OPTION
O2 NIST GAS FITTING
AIR NIST GAS FITTING
N2O NIST GAS FITTING
DISS BODY OPTION
O2 DISS BODY GAS FITTING
AIR DISS BODY GAS FITTING
N2 O DISS BODY GAS FITTING
DISS NUT OPTION
O2 DISS NUT GAS FITTING
AIR DISS NUT GAS FITTING
N2O DISS NUT GAS FITTING
SU14700

GAS SYSTEM COLOR CODING					
GAS	**MARKING**	**U.K.**	**U.S.A.**	**GERMANY**	**CANADA**
Air	AIR	Blk/Wht Chkrd	Yellow	Yellow	Blk/Wht Chkrd
Carbon Dioxide	CO_2	Gray	Gray	Gray	Gray
Nitrous Oxide	N_2O	Blue	Blue	Gray	Blue
Oxygen	O_2	White	Green	Blue	Wht/Brown

Section 4
Gas Supply Connections

WARNING: Oil and grease may combine explosively with oxygen or nitrous oxide. For this reason, oil and grease must never come in contact with pipelines, cylinders, cylinder valves, gauges, fittings, etc., which conduct oxygen or nitrous oxide within the machine. For further information regarding safety precautions in the use of medical gases, consult Compressed Gas Association pamphlet P-2 and appropriate sections of National Fire Protection Association Standard 99.

Connect the pipeline supply hoses as follows:

1. Verify that the hoses have the correct gas fittings. Connect the gas fitting on each supply hose to the corresponding gas fitting on the side of the flowmeter housing. Use a wrench to tighten the hex nut.

WARNING: Both ends of each gas supply hose must be indexed for the same gas. Pipeline delivery hoses used between wall outlets and anesthesia machines have caused accidents when, during assembly, an oxygen fitting has been placed on one end of the hose and a nitrous oxide fitting on the other end.

2. Connect the other end of each supply hose to the appropriate functioning hospital pipeline outlet.

3. Check the pipeline pressure gauge on the front of the NARKOMED 4 for sufficient pipeline pressure (50-55 psi).

Section 5
System Power-Up

Connecting the NARKOMED 4 to Electrical Power

The NARKOMED 4 is equipped with a power cord and a hospital grade plug for 117 VAC primary electrical power. Machines wired for 220 - 240 VAC primary electrical power are supplied without a cord connector. An appropriate connector must be installed on the cord by a qualified electrician.

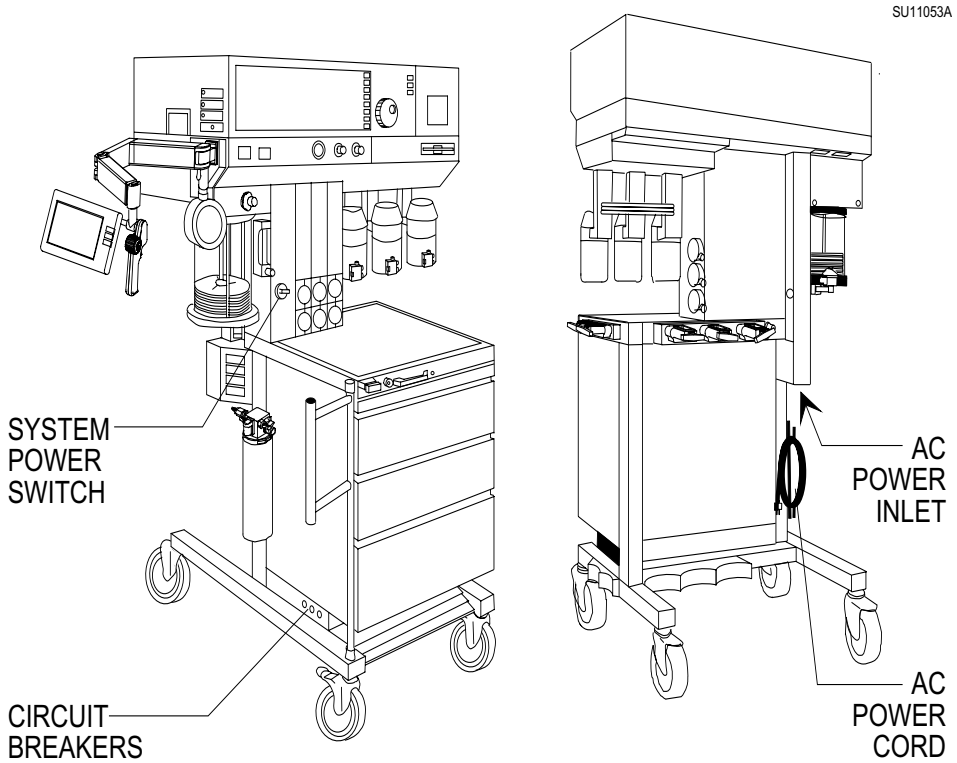
Connect the NARKOMED 4 to electrical power as follows:

1. Verify that the NARKOMED 4's SYSTEM POWER switch is set to STANDBY.

2. Verify that all circuit breakers are in the "set" (pushed in) position.

3. Unwrap the power cord and connect its female end to the power inlet connector.

4. Plug the power cord into an active AC hospital grade outlet.



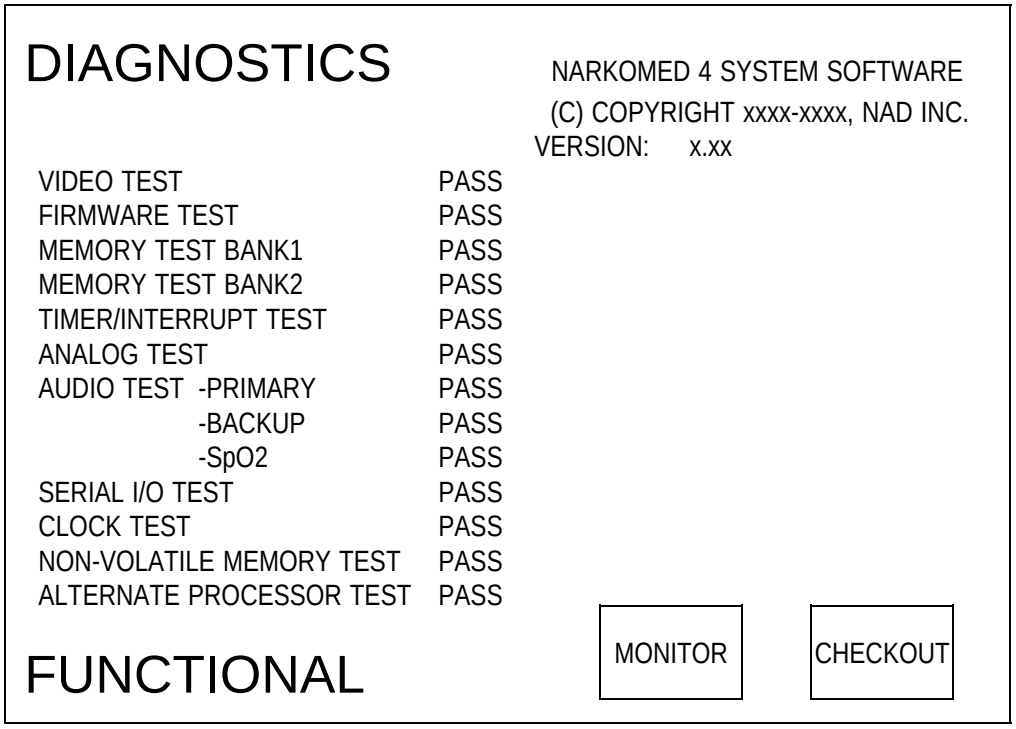
Section 5
System Power-Up

Power-Up Diagnostics Test

1. Turn the NARKOMED 4's SYSTEM POWER switch to ON. The self-diagnostic screen is displayed. A typical power-up diagnostic screen is shown in the illustration.

2. Verify that the battery-in-use (AC POWER FAIL) indicator on the main switch panel remains unlit.

3. Verify that all circuit breakers remain in the "set" (pushed in) position.



6.0 PMC PROCEDURE, Narkomed 4

The procedures in this section shall be performed in their entirety each time a component is removed, replaced, calibrated, adjusted and during all scheduled Periodic Manufacturer's Certification (PMC) visits. A PMC Checklist form, P/N S010052, is available from DrägerService, shall be completed by the Technical Service Representative (TSR) each time a PMC is performed. Steps in the procedure marked with (✓) require a response at the corresponding line on the checklist form.

Space is also provided on the PMC checklist form to record the results of a vapor concentration test. Contact DrägerService for vapor concentration verification procedures.

NOTE: The test equipment listed below with an asterisk (*) requires calibration at a maximum interval of one year. Verify the dates on test equipment calibration labels. DO NOT USE any test equipment having an expired calibration date. Notify your supervisor immediately if any equipment is found to be out of calibration. In the space provided at the bottom of the PMC checklist form, record the Model and ID number of all calibrated test equipment.

In the space provided at the bottom of the PMC checklist form, record the Model and ID number of all calibrated test equipment used. Also record the calibration due dates.

Test Equipment Required:

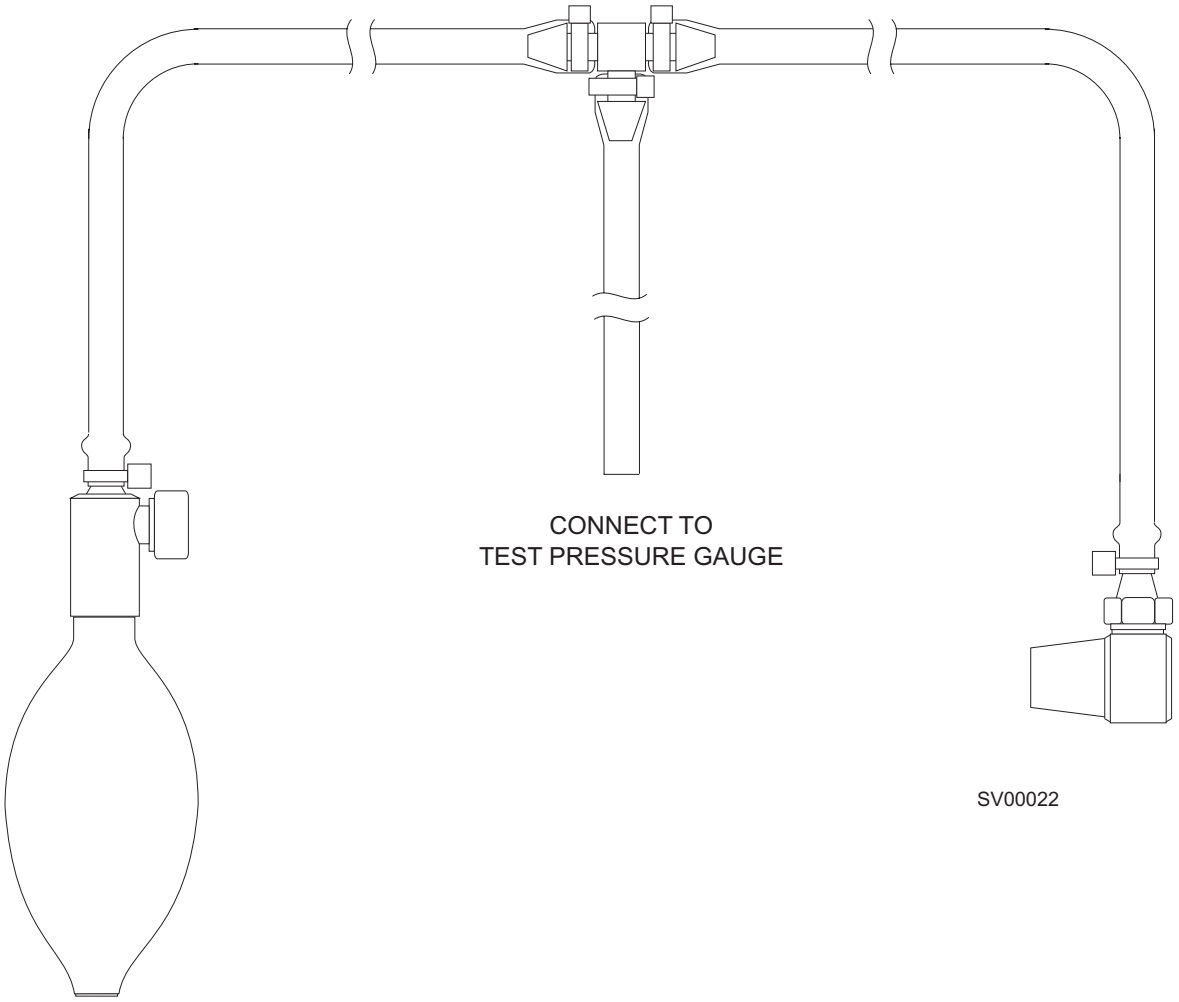
-- Nelcor PT2500 pocket tester (for SpO2 cal check)
* -- Novametrix TB500B sensor simulator (for SpO2 cal check)
* -- Multi-Meter (Fluke or equivalent)
* -- Electrical Safety Analyzer (Biotek 501 Pro or equivalent)
* -- Pressure Gauge w/ DISS Adapters, P/N 4114807 or equivalent
-- Fresh Gas Outlet Volume Test Device, P/N S010158 or equivalent
-- Fresh Gas Leak Test Device, P/N 4113119 or equivalent
-- Adapter Assembly, Test Terminal, P/N 4104389 or equivalent: two are required
* -- Flowmeter Test Stand (Capnomed), P/N S000081 or equivalent
-- Breathing System Leak Test Device, P/N S010159 or equivalent
-- Baromed Pressure Test Fixture or equivalent
* -- Test Minute Volume Meter, P/N 2212300 or equivalent
* -- Digital Pressure Manometer (SenSym PDM 200CD or equivalent)
* -- Riken Gas Indicator, Model 18H, or 1802D or equivalent
-- Stop Watch
-- Service Test Lung, P/N 8401892
-- AC Receptacle Circuit Tester

Materials Required:

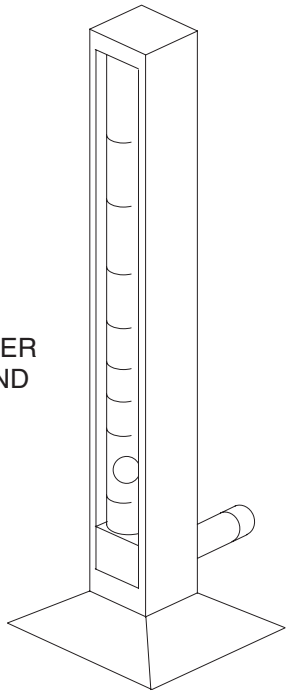
--Dow Corning High Vacuum Grease, P/N S4105908
-- Spiromed Sensor Lubrication Kit, P/N 2218180
-- Breathing Bag, 3 liter, P/N 9995330
-- Tube, Corrugated, 22 mm x 12 in. long, P/N 9995112

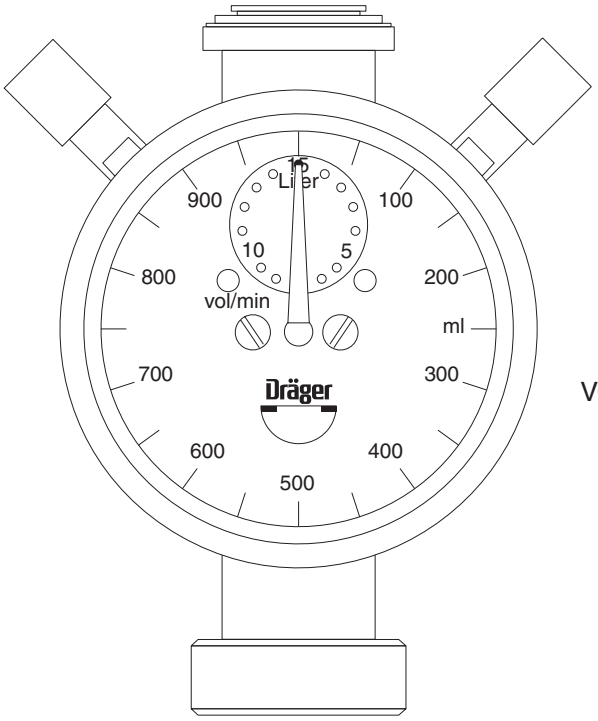
Test equipment illustrations are shown on the following pages:

4113119
FRESH GAS LEAK TEST DEVICE



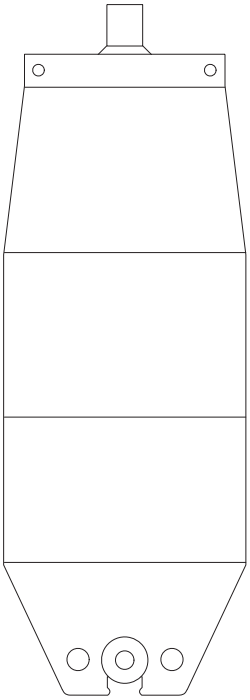
S000081
FLOW METER
TEST STAND



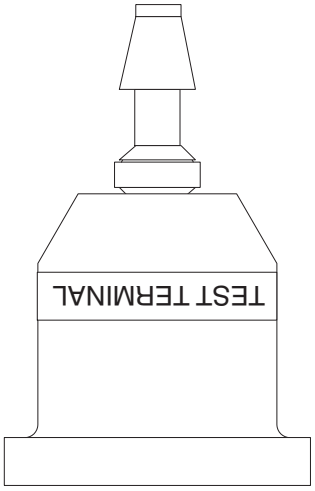


2212300
MINUTE
VOLUMETER

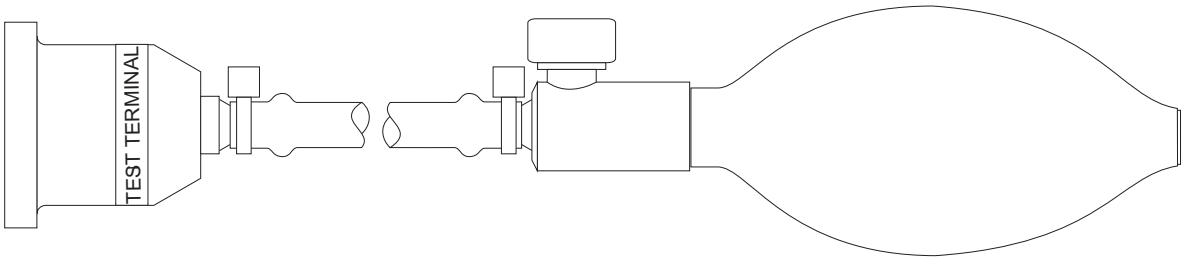
8401892
SIEMENS TEST LUNG



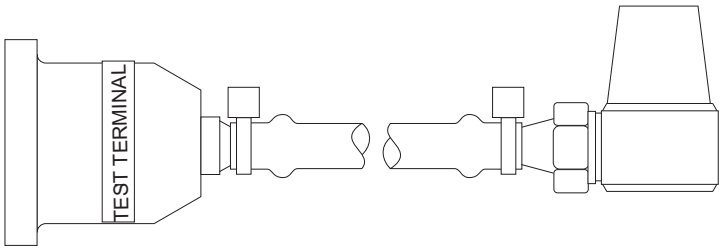
4104389
TEST TERMINAL
ADAPTER



SP15002

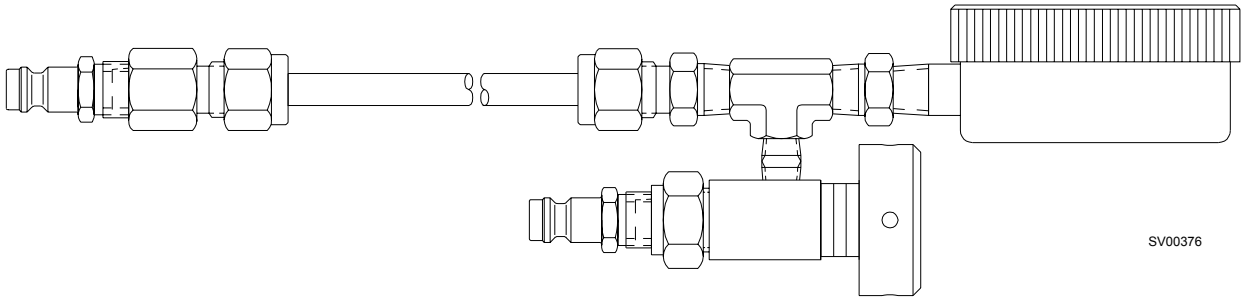


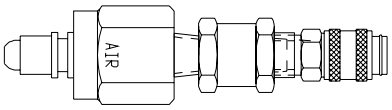
S010159
BREATHING SYSTEM LEAK TEST DEVICE



S010158
FRESH GAS OUTLET VOLUME TEST DEVICE

4114807 PRESSURE TEST ASSEMBLY , WITH ADAPTERS





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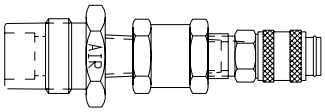

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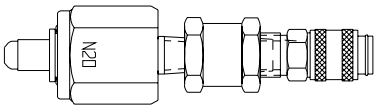

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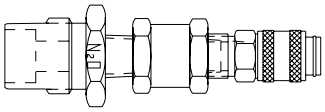

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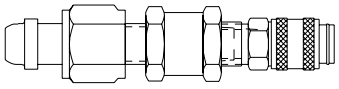

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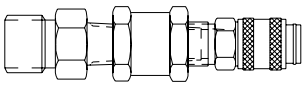

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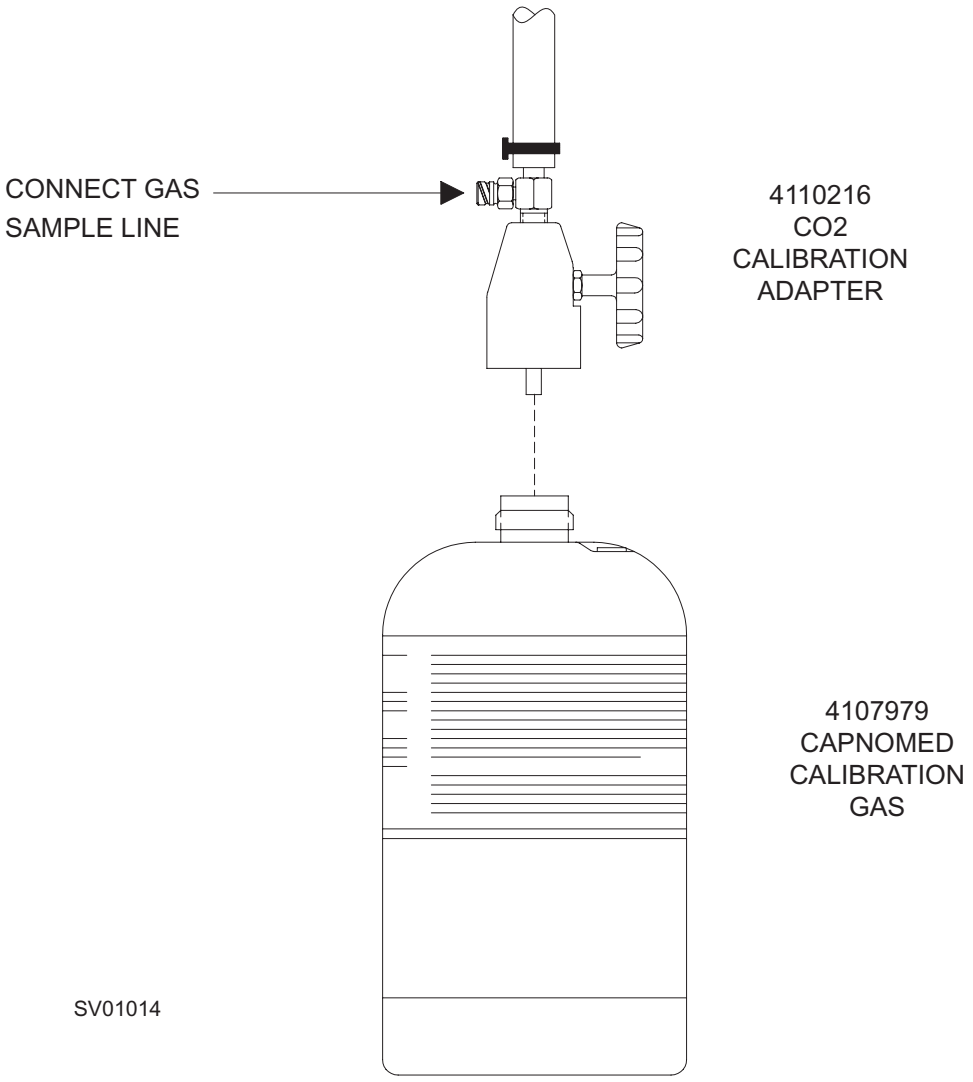
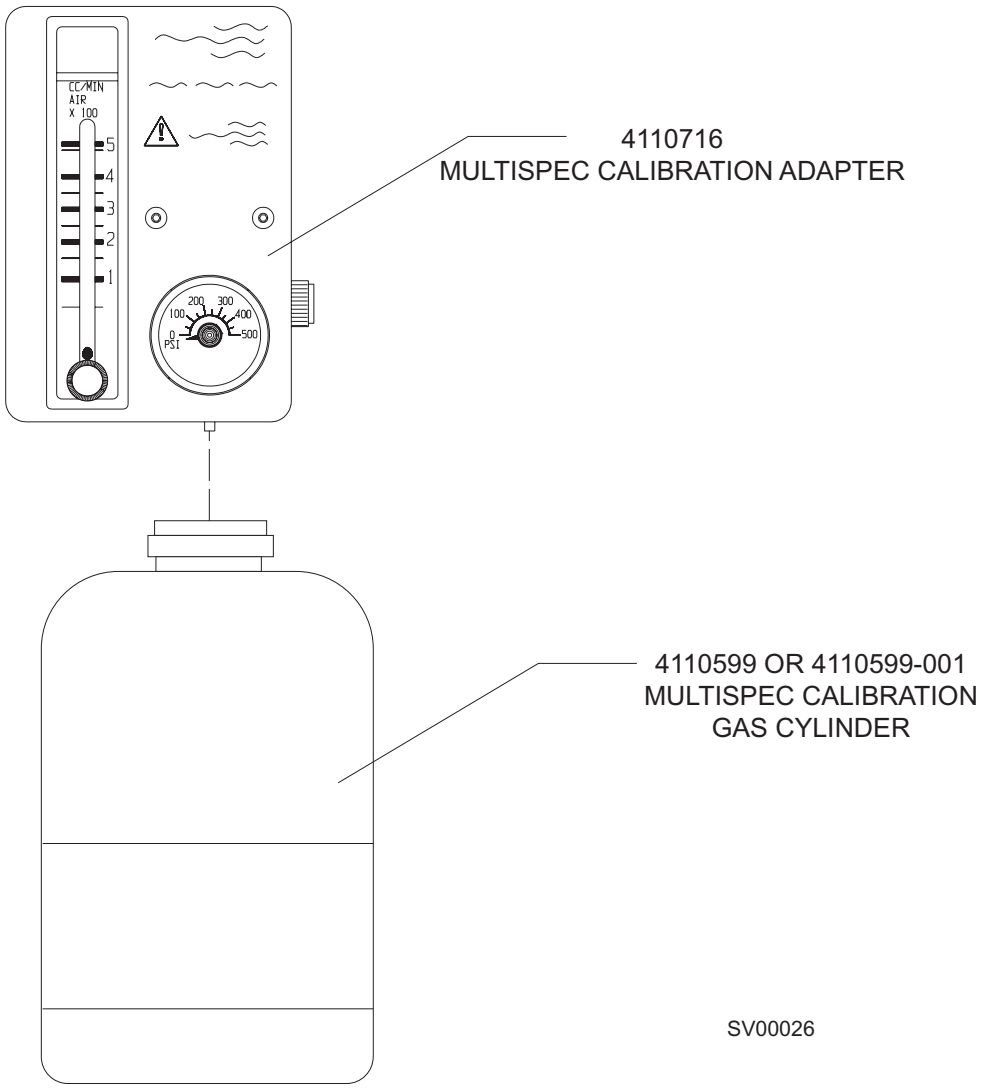


TEST EQUIPMENT FOR AGENT
ANALYZER ACCURACY TEST



4110683
MULTISPEC CALIBRATION KIT

Periodic Manufacturer's Certification General Instructions

The purpose of these procedures is to provide detailed instructions for performing a Periodic Manufacturer's Certification (PMC) inspection on the Narkomed 4 anesthesia machine.

A PMC consists of a complete Periodic Manufacturer's Service procedure and a certification level inspection based on Draeger Medical, Inc. Recommendations and equipment performance. Additional inspections are also performed to ensure proper product labeling.

Several additional documents have been created to assist the technician through the process. Following is a brief description of the purpose of each document.

Field Service Procedure:
Periodic Manufacturer's Certification Forms - Part Number SP00175.
This procedure illustrates the sample checklists with typical periodic maintenance items filled in, including vapor concentration verification tests, parts replaced, general comments and certification levels. Also included are sample PMC labels marked to show several levels of certifications. An excerpt from Draeger Medical, Inc.'s *Anesthesia System Risk Analysis and Risk Reduction* is included, and also a sample of an Executive Summary to be furnished to the hospital's Risk Manager or Chief of Anesthesia.

Field Service Procedure:
NAD Recommendation Guidelines Index Anesthesia Systems - Part Number S010250.
This Guideline was created to provide an assessment of each machine's certification. It contains various comprehensive overviews of possible equipment conditions and their associated certification levels.

The first list in the Recommendation Guidelines is a reference chart for machine certification based on equipment status. The second is an abbreviated summary of all DMI Recommendations and Failure Codes including the Condition Number, Equipment Condition, Recommended Corrections, Certification Code, and Tests Affected when applicable.

There is also a matrix classified as "Failure Codes" which identifies the correct manner in which to document equipment tests that fail, or were unable to be performed due to circumstances beyond the control of the service technician performing the inspection. (Ex: Air cylinder supply is unavailable to perform Air High Pressure Leak test.) The Failure Codes section also indicates suggested resolution of the situation. Failure Code numbers begin at 34 and use the same certification levels strategy, and carry the same weight as DMI Recommendation equipment condition codes.

The final matrix is the most comprehensive index sorted by machine model and includes Equipment Condition, Certification Code, and DMI Recommendations. It also specifies any suggested upgrade path including ordering information that should be taken such as installing a Bellows with Pressure Limit Control 4109664-S01, after market modification kit to a machine not equipped with pressure limit control.

The letters A, B, C, D and the Roman Numerals I, II are used as codes in the individual matrix for each model of anesthesia machine. The letters A, B, C, and D are used in descending order to indicate the certification level of the equipment. They are as follows:

A = Certified
B = Certified with Recommendations
C = Conditionally Certified
D = No Certification

Roman Numerals I and II do not affect the certification level but rather are provided to give further instructions to the end user as follows:

I = The system in its present configuration shall only be used with a CO2 monitor incorporating an apnea warning. The operator of the system is advised to frequently scan the CO2 readings and alarm thresholds.

II = The present configuration of equipment requires that the unit operate at all times with an oxygen analyzer that includes a low oxygen warning. The operator of the system is advised to frequently scan the oxygen readings and alarm limits.

Following is an explanation of machine certification levels:

Certified- No recommendations apply to machine being inspected. (Only item number 33 - “No Recommendations” shall apply for this certification level.)

Certified with Recommendations- A numbered recommendation with a code of B applies to the machine being examined.

Conditionally Certified- A numbered recommendation with a code of BC, BCI or BCII applies to the machine being examined.

No Certification- A numbered recommendation with a code of D applies to the machine being examined.

When multiple recommendations apply, “No Certification would take precedence over “Conditionally Certified” and “Certified with Recommendations”. “Conditionally Certified” would take precedence over “Certified with Recommendations”.

For example:

A **Narkomed 3** could have recommendation number 21 and failure code 61.1 apply.
21 - No ventilator pressure limit control. Code is B.
61.1 - Enflurane agent is unavailable to test. Code is BC.
Correct certification for this machine is BC, which means CONDITIONALLY CERTIFIED WITH RECOMMENDATIONS.

A **Narkomed 4** could have recommendation numbers 14 and 21 apply.
14 - CO2/Agent monitor exhaust port is not properly connected to the waste gas scavenger. Code B.
21 - No ventilator pressure limit control. Code B.
The correct certification for this machine is B, which means “CERTIFIED WITH RECOMMENDATIONS”.

A **Narkomed 2B, 2C** or **GS** could have recommendation 30 apply.
30 - Anesthesia machine is equipped with inhalation anesthesia vaporizers without an agent analyzer in the breathing system. Code B.
The correct certification for this machine is B, which means “CERTIFIED WITH RECOMMENDATIONS”.

A **Narkomed 6000** could have no NAD recommendations or failure codes apply. The correct certification level for this machine is Code A, “CERTIFIED”.

Code D, which means “NO CERTIFICATION”, also means the machine shall not receive a Periodic Manufacturer’s Certification label. The machine shall also receive a “WARNING - This System is Not Certified” label, P/N 4114857. This label shall be placed at a prominent location on the right side of the machine after all other previous PM and “Vigilance Audit® Validation” labels have been removed.

NOTE: The following calibrations must be performed before beginning the PMC Procedure (refer to Section 5 in the Narkomed 4 Service Manual, Adjustment and Calibration Procedures):

Oxygen Sensor Zero Calibration
Breathing Pressure Monitor Calibration
Respiratory Flow Monitor Calibration
SpO2 Monitor Calibration Check
NIBP Inflation Pressure Calibration Check

PM Certification Procedure for Narkomed 4 Anesthesia System

1. Use the PM Certification form for Narkomed 4 Anesthesia Systems (P/N S010052).
2. Completely fill in the header information.
3. Determine if the ventilator has an MJV-2 square Clippard valve. If ventilator has an MJV-2, perform the lubrication procedure in accordance with SP00062. Write in the date of lubrication next to the "MJV-2 LUBRICATION" line on the Periodic Manufacturer's Certification form. If the ventilator has a Humphrey valve, indicate so with a (H) next to the "MJV-2 LUBRICATION" line on the Periodic Manufacturer's Certification form.
4. Replace the VENTILATOR RELIEF VALVE DIAPHRAGM in accordance with SP00075. Place a check mark and the replacement date at "VENT RELIEF VALVE REPLACEMENT" line on the Periodic Manufacturer's Certification form.
5. If a TEC 6 DESFLURANE vaporizer is mounted to the machine, a label stating: "WARNING THE ADMINISTRATION OF DESFLURANE ANESTHESIA MAY REQUIRE FRESH GAS CONCENTRATIONS HIGHER THAN COMMONLY USED WITH OTHER VOLATILE ANESTHETIC AGENTS. O2 FRESH GAS CONCENTRATION OF LESS THAN 21% MAY BE OBTAINED WITH HIGH VAPORIZER SETTINGS. CONTINUOUS MONITORING OF THE O2 CONCENTRATION IN THE BREATHING SYSTEM IS THEREFORE REQUIRED. DRAEGER MEDICAL, INC. RECOMMENDS THE CONTINUOUS MONITORING OF THE CONCENTRATION OF ANESTHETIC VAPORS IN THE BREATHING SYSTEM DURING THE ADMINISTRATION OF INHALATION ANESTHESIA."(Part # 4112737-001) Shall be attached to the vapor box immediately above the TEC6 vaporizer.
6. Check all vapor 19 and 19.1 vaporizers for correct labeling. All vaporizers must have a label stating "THE CONCENTRATION OUTPUT OF THIS VAPORIZER SHALL BE VERIFIED AFTER IT HAS BEEN ATTACHED TO THE ANESTHESIA MACHINE" (part # S010015). This label shall be attached to the rear of the vaporizer directly below the mount.
7. All Key Index Safety Systems vaporizers, (K.I.S.S.) must have a label stating "CAUTION: AFTER FILLING HAS BEEN COMPLETED, REINSERT PLUG INTO UPPER FILLER PORT AND TIGHTEN LOCKING SCREW" (part # 4112520-001). This label shall be attached to the vaporizer directly above the keyed filler. Place a check mark at "K.I.S.S. LABEL" on the PM Certification form.

8. If machine is equipped with a HALOTHANE Dräger Vapor 19 or 19.1 vaporizer, determine if vaporizer must be inspected for soil condition one. Check the serial number plate located on the rear of the vaporizer for a plus (+) preceding the serial number. A HALOTHANE vaporizer serial number not preceded with a (+) must be tested for soil in accordance with SP00073. If vaporizer does not need to be inspected, indicate so with a plus (+) next to the "Vapor Inspection (H)" line on the Vigilance Audit form. If vaporizer is soil condition 0, indicate so with "SOIL 0" written next to the "Vapor Inspection (H)" line on the Vigilance Audit form. If vaporizer is soil one, indicate so with "SOIL 1" written next to the "Vapor Inspection (H)" line on the Vigilance Audit form. Place a "CAUTION DO NOT USE" label (part # 4114327) on the vaporizer, and issue a departmental alert. The TSR shall also seek permission from the equipment operator to remove the failed vaporizer from the machine and apply a replacement vaporizer or an adapter block onto the mount. All "SOIL 1" vaporizers must be removed from service for machine to receive certification.
9. Perform the vapor concentration test on all Dräger vapor vaporizers in accordance with SP00073 at a six month maximum interval. Perform the vaporizer concentration test on all Desflurane vaporizers in accordance with SP00091 for fixed mount vaporizers and SP00189 for user removable D-tec vaporizers at a six month maximum interval. For every vaporizer tested, fill out a "VAPOR VAPORIZER CALIBRATION CHECK" label (part # S010016). Information on this label shall include your signature, type of agent, date tested, test results @ 1%, 2.5%, 4% for H, E, I, or S vaporizers, or @ 4%, 10%, 12%, 16% for Desflurane vaporizers, and a PASS or FAIL indication. This label shall be attached to the upper right side of the vaporizer. If vaporizer fails the concentration verification, internal leak, or exclusion system tests, check "NO" in the "RECOMMENDED FOR USE" section on the PM Certification form. Place a "CAUTION DO NOT USE" label (part # 4114327) on the vaporizer, and issue a departmental alert. The TSR shall also seek permission from the equipment operator to remove the failed vaporizer from the machine and install a replacement vaporizer or an adapter block onto the mount. All nonfunctional Dräger vapor vaporizers must be removed from service for machine to receive certification.
10. Proceed with PM Certification procedure. If any tests fail refer to the "Failure Codes" listing in DMI Recommendations Guidelines Index (P/N S010250) to determine correct certification level starting point. Failure codes shall be documented on the "RECOMMENDATIONS / GENERAL COMMENTS" section of the PM Certification form and on the Executive Summary. If a test fails that has not been identified by the "Failure Codes" list, consult with Draeger Medical, Inc. to assess the proper certification level.
11. Based on the "EQUIPMENT CONDITION" inspect the machine for any "DMI RECOMMENDATIONS" that would apply. Use the Narkomed 4 section of the "RECOMMENDATION GUIDELINES INDEX" (P/N S010250). Note all applicable DMI recommendations on the Executive Summary.

NOTE: If using a carbon form, indicate the Equipment Condition number and to see reverse side under the "RECOMMENDATIONS / GENERAL COMMENTS" section of the form.

12. Determine the correct certification level of the machine based on the combined lowest common denominator of "Equipment Conditions" and "Failure Codes". If the machine is at least conditionally certified fill out the ""PM CERTIFICATION" label. Check the box(s) on the validation label where appropriate. Write the month and year, (three months from date of PM Certification) next to "NEXT VISIT DUE:" If certification level is "D", machine shall not receive a "PM CERTIFICATION" label. Any machine not receiving a PM Certification label shall receive a "WARNING NOT CERTIFIED" label. This label shall be placed at a prominent location on the left side of the machine after all other previous PMC and Vigilance Audit Validation labels have been removed.
13. In the "CERTIFICATION LEVEL" section of the PM Certification form, record the last visit certification level, the current certification level and the next visit due month and year, (three months from date of PM Certification) in the spaces provided.
14. If applicable, remove the previous PM CERTIFICATION VALIDATION label and attach the new label (P/N S010006 w/phone #, or P/N S010007 w/o phone #) in a prominent location on the rear of the anesthesia machine.
15. Check the appropriate boxes on the "PM CERTIFICATION NOTICE" label, (part # S010011). If the machine is not certified, the last box of this notice label shall be marked. Attach this notice to the flow shield of the anesthesia machine.
16. Have the customer sign each PM Certification form or the Executive Summary, and review the equipment conditions and the recommendations with the customer.
17. Return top copy to Draeger Medical, Inc. Service Department, keep middle copy for service organization records, give bottom copy to customer.

(✓) **6.1 Self Diagnostics**

6.1.1 Turn the System Power switch to ON and verify the "ON" LED is lighted.

6.1.2 If applicable, verify all LED's and 7 segment displays on the AVII or AVII+ are lit.

6.1.3 Verify that the following is displayed on the two Main Displays and Remote Display:

NOTE: If the unit is equipped with an ORDM, the ORDM boot up screen will be displayed on the Remote Display. After the ORDM completes its self test, the screen will revert to the NARKOMED 4 Diagnostic screen.

DIAGNOSTICS

NARKOMED 4 SYSTEM SOFTWARE
© COPYRIGHT 1988-1999, NAD INC.
VERSION: X.XX XXXX

VIDEO TEST
FIRMWARE TEST
MEMORY TEST BANK 1
MEMORY TEST BANK 2
TIMER / INTERRUPT TEST
ANALOG TEST
AUDIO- PRIMARY
BACKUP
SPO2 AUDIO HARDWARE
SERIAL I/O TEST
CLOCK TEST
NON-VOLITILE MEMORY TEST
ALTERNATE PROCESSOR TEST

POWER SUPPLY STATUS:
FULLY FUNCTIONAL

FUNCTIONAL

MONITOR | CHECKOUT

(✓) 6.1.4 Record software version, where applicable on the appropriate form.

6.1.5 Turn Machine to “Standby”.

6.2 Electrical Safety- One Year Service Interval

(✓) 6.2.1 Ground Continuity Test

6.2.1.1 Unplug the AC power cord for all devices mounted on, or attached to, the machine that may provide an alternate path to earth ground, such as a Desflurane Vaporizer.

6.2.1.2 Unplug the machine AC power cord and plug it into the receptacle on the Safety Analyzer. Plug the Safety Analyzer into the open AC wall outlet.

NOTE: Do not plug the Safety Analyzer power cord into a line isolation monitor, as inaccurate readings may occur.

6.2.1.3 Turn ON the Safety Analyzer. Configure the Safety Analyzer to measure “RESISTANCE” according to the manufacturer’s documentation.

6.2.1.4 If necessary, perform a Resistance Calibration on the Safety Analyzer according to the manufacturer’s documentation.

6.2.1.5 Set the Safety Analyzer "GROUND" switch to the "NORMAL" position. Set the "POLARITY" switch to the "OFF" or “NORMAL” position.

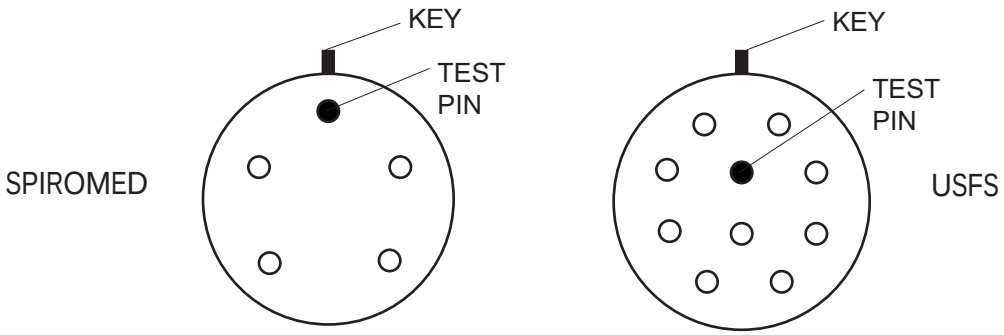
6.2.1.6 The Safety Analyzer shall indicate 0.1 ohms or less with its test lead applied to the following point:

--Cylinder yoke bolt

(✓) 6.2.2 Circuit Isolation Test

6.2.2.1 Disconnect the Volume sensor cord from the interface panel.

6.2.2.2 Using a multimeter set to the highest resistance range, measure between the Cylinder yoke bolt and the respective test pin, as shown in the illustrations below, for the type of Volume Sensor present. There shall be no continuity between these two points



6.2.2.3 Reconnect the Volume sensor cord to the interface panel.

6.2.3 Chassis Leakage Current Test

6.2.3.1 Turn the System Power switch to ON and set the Safety Analyzer to measure "CHASSIS LEAKAGE CURRENT" according to the manufacturers documentation.

6.2.3.2 Attach the Safety Analyzer test lead to a cylinder yoke bolt.

6.2.3.3 Record the total leakage current with the POLARITY and GROUND switches set to the following positions:

		Ground	Polarity
(✓)	6.2.3.3.1	Open	Normal
(✓)	6.2.3.3.2	Normal	Normal
(✓)	6.2.3.3.3	Open	Reversed
(✓)	6.2.3.3.4	Normal	Reversed

Verify that the leakage current is 100 μA* or less in each of the positions (110 μA or less for 220/240 volt power supply option).

* 300 μA if external monitors are plugged into convenience outlets.

6.2.3.4 Turn OFF and unplug the Safety Analyzer. Remove the machine AC power cord from the Safety Analyzer and plug it into the original AC outlet. (Machine still ON)

(✓) **6.2.4 Convenience Receptacle and Auxiliary Outlet Strip**

NOTE: This test will check the convenience receptacle and the auxiliary strip outlets for fault conditions such as open ground, reverse polarity, open line and open neutral.

6.2.4.1 Unplug all power cords from the convenience receptacles and auxiliary outlet strip.

6.2.4.2 Plug the Receptacle Tester into the first outlet to be tested. Verify no wiring fault is indicated then remove test plug and move it to the next convenience outlet. Repeat this process until all convenience outlets and auxiliary strip outlets are tested.

6.2.4.3 Plug-in all power cords previously removed from the convenience receptacles and auxiliary outlet strip.

(✓) 6.3 Configuration

6.3.1 Press “SYSTEM CONFIG” hard key to enter the System Configuration Screen.

6.3.2 Select “SYSTEM FUNCTIONS” softkey.

6.3.3 Verify current Time and Date.

6.3.4 Press “MONITOR” hardkey to return to the Main Screen.

(✓) 6.4 Service Data

6.4.1 Press and hold the “MONITOR” and “SYSTEM CONFIG” hardkeys, while pressing the Datagrip Tirgger to enter the Main Service Screen.

6.4.2 Touch the “SERVICE LOG” softkey to view Service Log. Use Selection Dial to scroll thru Service Log and verify any pertinent information. Contact Drager Medical, Technical Support if necessary. Touch the “MAIN” softkey to return to MAIN service screen

6.4.3 Touch the “VIEW” softkey and scroll to “PMS”. Press Datagrip trigger. Highlight, and enter your Technical Service Representative I.D. code, one block at a time using the Selection dial. Press Selection Dial to “Enter” each digit.

6.4.4 Touch the “RESET” softkey. Verify that the “LAST SERVICE DATE” resets to the current date and the “HOURS RUNNING SINCE LAST SERVICE” reset to zero (0).

6.4.5 Touch the “PMS CRITERIA” softkey. Select and enter the month of the next service due date. The internal clock of the machine limits the amount of date advance to a maximum of six months from the current service date. Touch the “MAIN” softkey to return to the MAIN Service screen.

6.4.6 Turn the System Power switch to “STANDBY”.

(✓) 6.5 Absorber Inspection and Maintenance

(✓) 6.5.1 Repack MAN/AUTO Selector Valve- If Applicable

NOTE: Does not apply to machines with later design selector valve. Proceed to step 6.5.2.

6.5.1.1 Remove the four screws securing the stick shift block to the selector valve body and remove the block.

6.5.1.2 Remove the spring and valve channel from the valve body.

6.5.1.3 Remove all residual lubricant from the valve channel.

6.5.1.4 Remove all residual lubricant from the valve body.

6.5.1.5 Apply a minimal amount of Dow Corning lubricant to the tapered surface of the valve channel, and ensure complete coverage of lubricant.

6.5.1.6 Insert the valve channel into the valve body.

6.5.1.7 Insert the spring into the stick shift block.

6.5.1.8 Align the index pins on the stick shift block to the holes in the valve channel.

6.5.1.9 Secure the stick shift block to the selector valve body with the four screws that were previously removed.

6.5.2 Remove the O2 Sensor Housing and/or Oxygen Sensor Plug from the Inspiratory valve dome and examine the O-rings on each assembly. Replace O-rings as necessary.

6.5.3 Remove the Inspiratory and the Expiratory valve domes.

6.5.4 Are any pins on the valve crater damaged? Inspiratory ___ (N) Expiratory ___ (N) Replace as necessary.

6.5.5 Are any pins on the valve domes damaged? Inspiratory ___ (N) Expiratory ___ (N) Replace as necessary.

6.5.6 Is each valve disc in good condition? Inspiratory ___ (Y) Expiratory ___ (Y) Replace as necessary.

6.5.7 Are the valve dome washers in good condition? ___ (Y) Replace washers as necessary.

6.5.8 Reinstall the Inspiratory and Expiratory valve domes.

(✓) **6.5.9 Ultrasonic Flow Sensor- If Applicable**

6.5.9.1 Remove the Ultrasonic Flow Sensor connector hose.

6.5.9.2 Are the connector hose, connector, and O-ring components in good condition? Replace components as necessary. ___ (Y)

6.5.9.3 Remove the Expiratory valve.

6.5.9.4 Is the washer under the valve in good condition? ___ (Y) Replace washer as necessary.

6.5.9.5 Reattach the Expiratory valve.

6.5.9.6 Remove the Ultrasonic Flow Sensor from the mounting bracket.

6.5.9.7 Remove the flow housing/transducer assembly from the electronics housing.

6.5.9.8 Remove both transducers from the flow housing; examine each O-ring and condition of all components, replace O-rings as necessary, then reassemble the Ultrasonic Flow Sensor.

6.5.9.9 Reattach the Ultrasonic Flow Sensor to the mounting bracket.

6.5.9.10 Reattach the connector hose between the Ultrasonic Flow Sensor and Expiratory valve.

(✓) **6.5.10 Spiromed Sensor- If Applicable**

6.5.10.1 Remove the expiratory valve.

6.5.10.2 Is the washer under the valve in good condition? ___ (Y) Replace washer as necessary.

6.5.10.3 Remove the Spiromed Sensor.

6.5.10.4 Is the washer under the sensor in good condition? ___ (Y) Replace washer as necessary.

6.5.10.5 Locate the four lateral holes at the sides of the Spiromed Sensor marked by arrows.

CAUTION: Use only the Sensor Lubrication Kit P/N 2218180 for the following procedure.

6.5.10.6 Dip the tip of the pipette into the lubricant and draw lubricant into the pipette by pulling the pin backwards.

6.5.10.7 Insert the pipette into one of the four holes as far as it will go. Push the pin forward to its stop to inject lubricant into the hole. If using a syringe, apply the equivalent of “one drop”.

6.5.10.8 Repeat the previous 2 steps for lubrication of the three remaining holes.

6.5.10.9 Wipe any lubricant residue from the exterior of the sensor.

6.5.10.10 Reattach the Spiromed Sensor to the Absorber valve dome.

6.5.10.11 Reattach the Expiratory valve to Spiromed Sensor.

6.5.11 Remove the Inspiratory valve assembly.

6.5.12 Is the washer under the valve in good condition? ___ (Y) Replace washer as necessary.

6.5.13 Reinstall the Inspiratory valve.

6.5.14 Are there two (2) “E” clips on the absorber rods?___(Y) Replace as necessary.

6.5.15 Inspect the following: canisters canister gaskets, dust cup and O-ring, and soda lime.

6.5.16 Are the canisters, canister gaskets, dust cup and O-ring, and soda lime in good condition? ___ (Y) Replace components as necessary.

6.5.17 Verify the cm H2O gauge is at zero (0) and readjust/replace as necessary.

NOTE: The small slotted screw is the zero adjustment.

6.5.18 Reinstall the O2 Sensor plug into the Inspiratory valve dome.

6.5.19 Remove the Freshgas Hose Assembly from the FRESHGAS OUTLET.

6.5.20 Is the Freshgas Hose Assembly and Freshgas Outlet in good condition? ___ (Y)

6.5.21 Reconnect the Freshgas Hose Assembly to the FRESHGAS OUTLET.

(✓) 6.6 High Pressure Leak

NOTE: Minimum cylinder pressures required for High Pressure leak tests are:

N2O:	600 PSI
O2, AIR:	1000 PSI

6.6.1 Verify the Auxiliary Oxygen flow control valve is closed.

6.6.2 Disconnect all pipeline supply hoses at the wall outlets.

6.6.3 Open, then close and remove each cylinder. If applicable, remove the Yoke plug from the unused Yoke assemblies.

6.6.4 Note the pressure reading on each of the cylinder pressure gauges, and start a stop watch.

(✓) 6.6.5 Yoke Inspection

6.6.5.1 Are there two (2) yoke pins installed securely in each yoke?___(Y)

6.6.5.2 Is the proper gas I.D. label affixed to each yoke?___(Y)

6.6.5.3 Verify the presence of only one (1) cylinder washer. Add missing washer, remove additional washer or replace damaged washer as necessary.

6.6.6 After two (2) minutes, what is the pressure loss as indicated on the respective cylinder gauge? ___(<50)

6.6.7 Reattach and secure the cylinders to each Yoke assembly,

6.6.8 Open each cylinder valve.

6.7 Breathing System

6.7.1 Absorber & Fresh Gas Leak/ Vaporizer Leak/ Exclusion System Test

6.7.1.1 Close all flow control valves.

6.7.1.2 Set the AUTO/ BAG selector to BAG.

6.7.1.3 Close the APL valve.

6.7.1.4 Interconnect a 22 mm hose (P/N 9995132) between the inspiratory valve and expiratory valve or expiratory port on the ultrasonic flow sensor, if applicable.

6.7.1.5 Attach a manometer to Fresh Gas Leak Test Adapter (P/N 4115041). Attach a test terminal (P/N 4104389) to the Fresh Gas Leak Test Adapter then attach the test terminal to the bag mount.

6.7.1.6 Apply 50 cm H2O test pressure to the absorber system and start a stop watch.

6.7.1.7 What is the pressure on the absorber pressure gauge? ___ cm H2O (47 to 53)

(✓) 6.7.1.8 After thirty (30) seconds, is the breathing system test pressure $\geq$ 40 cm H2O? ___ (Y)

6.7.1.9 If applicable, turn on the left mounted vaporizer to the first graduated marking. Reapply 50 cm H2O of pressure to the system and start a stopwatch. Is it possible to turn on either the center or right vaporizers? ___ (N)

6.7.1.10 After thirty (30) seconds, what is the left vaporizer test pressure $\geq$ 40 cm H2O? ___ (Y) Turn off the left vaporizer.

6.7.1.11 If applicable, turn on the center mounted vaporizer to the first graduated marking. Reapply 50 cm H2O of pressure to the system and start a stopwatch. Is it possible to turn on either the left or right vapors? ___ (N)

6.7.1.12 After thirty (30) seconds, is the center vaporizer test pressure ≥ 40 cm H20? ___ (Y) Turn off the center mounted vaporizer.

6.7.1.13 If applicable, turn on the right mounted vaporizer to the first graduated marking. Reapply 50 cm H2O of pressure to the system and start a stopwatch. Is it possible to turn on either the left or center vapors? ___ (N)

(✓) 6.7.1.14 After thirty (30) seconds, is the right vaporizer test pressure ≥ 40 cm H2O? ___ (Y).

6.7.1.15 Open APL valve fully to its stop. (Counterclockwise)

(✓) 6.7.1.16 Did all vaporizer exclusion verifications test positive? ___ (Y)

(✓) **6.7.2 Vapor Configuration and Indicator Test**

6.7.2.1 Turn System Power switch to “ON”.

6.7.2.2 After Self Diagnostics have completed, wait until the message “CO2 TRACE AVAILABLE AT hh:mm” disappears from the CO2 Monitoring screen (approx 2 min). (CO2 WAVEFORM- no numerics)

6.7.2.3 Turn on the right mounted vaporizer. Verify the correct abbreviation appears in the correct order on the AGT display and the right Agt Indicator is lit. Turn OFF right mounted vaporizer.

6.7.2.4 Turn ON the center mounted vaporizer. Verify the correct abbreviation appears in the correct order on the AGT display and the center AGT Indicator is lit. Turn OFF center mounted vaporizer.

6.7.2.5 Turn ON the left mounted vaporizer. Verify the correct abbreviation, appears in the correct order on the AGT display and the left AGT Indicator is lit. Turn OFF left mounted vaporizer.

(✓) **6.7.3 APL Valve Test**

6.7.3.1 Verify the Scavenger is active.

6.7.3.2 Set the Oxygen flow to 10 l/min.

6.7.3.3 Is the test pressure between 0 to 3 cm H2O? (Y)

(✓) **6.7.4 PEEP, & PEEP w/Bypass Valve Test - If Applicable**

6.7.4.1 Set the O2 flow to 5 l/min.

6.7.4.2 * Place the PEEP bypass in the ON position.

6.7.4.3 Adjust the absorber PEEP valve clockwise to the maximum position.

6.7.4.4 Does the PEEP valve adjust smoothly? ___ (Y)

6.7.4.5 Is the maximum PEEP indicated on the test gauge between 15 to 22 cm H2O? ___ (Y)

6.7.4.6 * Place the PEEP bypass in the OFF position.

6.7.4.7 * Does the PEEP return to ≤? 3 cm H2O? ___(Y)

6.7.4.8 Adjust the absorber PEEP valve counterclockwise to its minimum position.

6.7.4.9 Does the PEEP return to ≤ ?3 cm H2O? ___(Y)

6.7.4.10 Close the O2 flow control valve.

* These items apply only to machines with a PEEP by-pass.

(✓) **6.7.5 O2 Flush Test**

6.7.5.1 Attach a 33 mm x 22 Female Adapter (P/N 4115087) to the top port of the test volumeter.

6.7.5.2 Disconnect the hose from the Expiratory valve or Expiratory hose terminal on the ultrasonic flow sensor, if applicable, and attach it to the test volumeter adapter. (hose is still attached to Inspiratory Valve)

6.7.5.3 Close the APL valve.

6.7.5.4 Press and hold the O2 FLUSH button for 6 seconds; multiply the value obtained by 10.

6.7.5.5 Is the calculated Oxygen flush flow rate 45 to 65 l/min.? ___ (Y)

6.7.5.6 After releasing the flush, does the flow of Oxygen stop immediately? ___ (Y)

6.7.5.7 Remove the test equipment.

(✓) **6.7.6 Expiratory Valve Leak**

6.7.6.1 Connect a 22 mm hose (P/N 9995132) between the Inspiration valve and the bag mount.

6.7.6.2 Connect a test terminal (P/N 4104389) to the Expiration valve or Expiratory hose terminal on the ultrasonic flow sensor, if applicable.

6.7.6.3 Connect a 0-250 ml/min. flowmeter (S000081) to the test terminal.

6.7.6.4 Turn up the Oxygen flow until the system pressurizes to 30 cmH2O. Adjust the APL valve as necessary to maintain 30 cmH2O.

6.7.6.5 Is the value indicated on the flowmeter between 0 to 60 ml/min.? ___ (Y)

6.7.6.6 Close Oxygen flow control valve.

6.7.6.7 Close APL valve.

6.7.6.8 Remove all test equipment.

(✓) **6.7.7 Inspiratory Valve Leak**

6.7.7.1 Turn the System Power switch to Standby.

6.7.7.2 Connect a test terminal (P/N 4104389) to the Inspiratory valve.

6.7.7.3 Connect a Fresh Gas Leak Adapter (P/N 4115041) and calibrated pressure meter to the test terminal on the Inspiratory valve.

6.7.7.4 Connect another test terminal to the bag connector.

6.7.7.5 Connect a 0-250 ml/min. flowmeter (S000081) to the test terminal on the bag mount.

6.7.7.6 Pressurize the test circuit to 30 cmH2O.

6.7.7.7 Is the value indicated on the flowmeter between 0 to 60 ml/min.? ___ (Y)

6.7.7.8 Turn the system power switch to ON.

6.7.7.9 Remove all test equipment.

(✓) **6.7.8 Bain Circuit Adapter - If Applicable**

6.7.8.1 Close the Bain Circuit APL valve by turning the knob fully clockwise.

6.7.8.2 Verify the cm H2O gauge at zero (0) and readjust/ replace if necessary.

NOTE: The small slotted screw is the zero adjust.

6.7.8.3 Insert the O2 sensor plug into the O2 sensor inlet on the Bain Circuit.

6.7.8.4 Attach a Breathing System Leak Device (P/N S010159) to the Breathing Bag port on the Bain Circuit.

6.7.8.5 Disconnect the pressure pilot line from the Bain Circuit and replace it with a PDM To Monitor Adapter (P/N 4115041).

6.7.8.6 Connect a test gauge to the adapter.

6.7.8.7 Occlude the expiration port on the Bain Circuit.

6.7.8.8 Apply 50cm H2O test pressure to the Bain Circuit.

6.7.8.9 Is the pressure indicated on the cmH2O gauge within 3 cm H2O of the digital pressure meter reading? ___ (Y)

6.7.8.10 After 30 seconds, is the test pressure 45 to 50 cm H2O? ___ (Y)

6.7.8.11 Open the APL valve by turning the knob fully counter-clockwise.

6.7.8.12 Connect a Fresh Gas Outlet Volume Adapter (P/N S010158) between the fresh gas outlet and the Expiration port of the Bain Circuit.

6.7.8.13 Set the O2 flow to 10 l/min.

6.7.8.14 Is the test pressure 0 to 3 cmH2O? ___ (Y) Close O2 Flow control valve.

6.7.8.15 Remove the test equipment and reconnect the pilot line to the Bain Circuit.

6.8 Oxygen Analyzer

6.8.1 Press the “MONITOR SETUP hardkey. Touch the “O2 CAL” key.

NOTE: Make sure that the sensor has stabilized in ambient air for several minutes.

(✓) 6.8.2 After calibration is completed, is the O2 concentration 21%? ___ (Y)

6.8.3 The warning message INSP O2 LOW shall appear on the Alarm display, and a continuous alarm shall sound.

(✓) 6.8.4 Press the Alarm Silence key and verify the audio alarm is silenced.

6.8.5 Place the Oxygen sensor housing into the Inspiratory valve dome adapter.

6.8.6 Set the AUTO/BAG selector to BAG.

6.8.7 Close the APL valve.

6.8.8 Attach a 22 mm hose (P/N 9995132) to the inspiratory valve.

6.8.9 Attach a Breathing System Leak Test Device (P/N S010159) to the bag mount.

6.8.10 Press the O2 Flush for 15 seconds.

6.8.11 Is the O2 concentration 90 to 100%? ___ (Y)

6.8.12 Release the O2 Flush, does the flow cease immediately? ___ (Y)

6.8.13 Set the Oxygen flow to 10 l/min.

(✓) 6.8.14 After 1 minute, is the O2 concentration 97 to 100%? ___ (Y)

6.9 Flowmeters and Gas Concentrations

(✓) **6.9.1 Oxygen Flowmeter**

6.9.1.1 Was it possible to adjust the flow of Oxygen over the full range of the flowmeters in the previous test? ___ (Y)

6.9.1.2 Set the Oxygen flow to 4 l/min.

6.9.1.3 Is the correct flow control knob and label attached to the Oxygen flow control valve? ___ (Y)

(✓) **6.9.2 Heliox (HeO2) Flowmeter - If Applicable**

6.9.2.1 Is it possible to adjust the flow of the Heliox over the full range of the flowmeter? ___ (Y)

6.9.2.2 Set the Heliox flow to 2 l/min.

6.9.2.3 *After the value stabilizes, is the O2 concentration 72 to 78%? ___ (Y)

6.9.2.4 Close the Heliox flow valve.

6.9.2.5 Is the correct flow control knob and label attached to the Heliox flow control valve? ___ (Y)

*Heliox specifications are given @ 25% O2. Cylinder content deviations will affect this value. The expected concentration values can be obtained by replacing the '25'% O2 value given for O2-HE with the actual cylinder content as follows:

$$\frac{(2 \text{ l/min HeO2} \times \text{'25'}) + (4 \text{ l/min. O2} \times 100)}{6 \text{ l/min - Total Flow}} = \% \text{ O2}$$

(✓) **6.9.3 Carbon Dioxide Flowmeter - If Applicable**

6.9.3.1 Is it possible to adjust the flow of the Carbon Dioxide over its range of 550 ml/min.? ___ (Y)

6.9.3.2 Set the Oxygen flow to 1000 ml/min.

6.9.3.3 Set the Carbon Dioxide flow to 500 ml/min.

6.9.3.4 After the value stabilizes, is the O2 concentration 64 to 70%? ___ (Y)

6.9.3.5 Close the Carbon Dioxide flow valve.

6.9.3.6 Readjust the Oxygen flow to 4 l/min.

6.9.3.7 Is the correct flow control knob and label attached to the Carbon Dioxide flow control valve? ___ (Y)

(✓) **6.9.4 Air Flowmeter - If Applicable**

6.9.4.1 If not configured with an Air Cylinder yoke, attach the Air Pipeline hose.

6.9.4.2 Is it possible to adjust the flow of the Air over the full range of the flowmeter? ___ (Y)

6.9.4.3 Set the Air flow to 2 l/min.

6.9.4.4 After the value stabilizes, is the O2 concentration 71 to 77%? ___ (Y)

6.9.4.5 Close the Air flow control valve.

6.9.4.6 Is the correct flow control knob and label attached to the Air flow control valve? ___ (Y)

(✓) **6.9.5 Nitrous Oxide Flowmeter**

6.9.5.1 Set the Nitrous Oxide flow to 2 l/min.

6.9.5.2 After the value stabilizes, is the O2 concentration 64 to 70%? ___ (Y)

6.9.5.3 Is the correct flow control knob and label attached to the Nitrous Oxide flow control valve? ___ (Y)

6.9.5.4 Is it possible to adjust the flow of Nitrous Oxide over the full range of the flowmeter? ___ (Y)

(✓) **6.9.6 Oxygen Ratio Control (w/ Bypass)/ Oxygen Ratio Monitor Control**

6.9.6.1 Open the Nitrous Oxide flow control valve to the stop position.

6.9.6.2 After the value stabilizes, is the O2 concentration 21 to 29%? ___ (Y)

6.9.6.3 Set the Oxygen flow to 2 l/min.

6.9.6.4 After the value stabilizes, is the O2 concentration 21 to 29%? ___ (Y)

6.9.6.5 Set the Oxygen flow to 1000 ml/min.

6.9.6.6 After the value stabilizes, is the O2 concentration 21 to 29%? ___ (Y)

6.9.6.7 Close the Oxygen flow control valve.

(✓) 6.9.6.8 * Is the minimum flow of Oxygen 100 to 200 ml/min.? ___ (Y)

(✓) 6.9.6.9 * Is the flow of Nitrous Oxide 375-750 ml/min.? ___ (Y)

NOTE: Not applicable to machines w/ ORMC.

6.9.6.10 Close the Nitrous Oxide flow control valve.

* Nitrous Oxide Bypass flow and Minimum Oxygen flow specifications are given @ 50 psi. Pipeline pressure deviations may affect these tests.

(✓) **6.9.7 Auxiliary Oxygen Flowmeter - If Applicable**

6.9.7.1 Connect a test pressure monitor to the Auxiliary Oxygen outlet using a PDM/Suction adapter (P/N 4115038).

6.9.7.2 Increase the pressure to 50 cm H2O. (Open valve slightly until desired pressure is achieved, then close valve)

6.9.7.3 After 10 seconds, is the pressure 40 to 60 cm H2O? ___ (Y)

6.9.7.4 Remove the test gauge and adapter.

6.9.7.5 Is it possible to adjust the Auxiliary Oxygen flowmeter over the full range of the flowmeter? ___(Y)

6.9.7.6 Set the Auxiliary Oxygen flow rate to 5 l/min.

6.9.7.7 Hold the Oxygen sensor at the Auxiliary Oxygen flowmeter outlet.

6.9.7.8 After the value stabilizes, is the O2 concentration 80 to 100%? ___ (Y)

6.9.7.9 Replace the Oxygen sensor into the Inspiratory valve dome.

6.9.7.10 Close the Auxiliary Oxygen flow control valve.

6.10 High Pressure Regulators – Six Month Service Interval

(✓) **6.10.1 N2O Regulator**

NOTE: Minimum cylinder pressure for N2O regulator test is 600 psi.

6.10.1.1 Configure the test gauge (P/N 4114807) using a N2O nut/stem DISS connector (P/N 4114830-004) on the hose, and N2O DISS body connector (P/N 4114830-003) on the valve body side. If the machine is configured with CSA style fittings reverse the position of the connectors.

6.10.1.2 Connect the test fixture hose to the machine's Nitrous Oxide pipeline inlet.

6.10.1.3 Connect the Nitrous Oxide pipeline supply hose to the test fixture.

6.10.1.4 Open the Nitrous Oxide and the Oxygen cylinder valves.

6.10.1.5 Set the Oxygen and Nitrous Oxide flows to 4 l/min.

6.10.1.6 Depress the push button on the test device.

6.10.1.7 Release the push button. After the pressure decay stabilizes, is the regulator output pressure 40 to 49 psi? ___ (Y)

6.10.1.8 Remove the test fixture.

NOTE: If a pressure decrease does not occur, either the hospital's supply pressure is too low or the regulator pressure is set too high.

(✓) **6.10.2 Air Regulator -If Applicable**

NOTE: Minimum cylinder pressure for Air regulator test is 1000 psi.

6.10.2.1 Configure the test gauge (P/N 4114807) using an Air nut/stem DISS connector (P/N 4114830-002) on the hose and a DISS body connector (P/N 4114830-001) on the valve body side. If the machine is configured with CSA style fittings reverse the position of the connectors.

6.10.2.2 Connect the test fixture hose to the machine's Air pipeline inlet.

6.10.2.3 Connect the air pipeline supply hose to the test fixture.

6.10.2.4 Set the Air flow to 4 l/min.

6.10.2.5 Depress the push button on the test device.

6.10.2.6 Release the push button. After the pressure decay stabilizes, is the regulator output pressure within tolerance given in the following table? ___ (Y)

NOTE: If a pressure decrease does not occur, either the hospital's supply pressure is too low or the regulator pressure is set too high.

Cylinder Pressure psi	USA Compensated Regulator output tolerances	Canadian Compensated Regulator output tolerances
2000	38 to 44	41 to 47
1800	39 to 45	42 to 48
1600	40 to 46	43 to 49
1400	41 to 47	44 to 50
1200	42 to 48	45 to 51
1000	43 to 49	46 to 52

6.10.2.7 Remove the test fixture.

(✓) **6.10.3 O2 Regulator**

NOTE: Minimum cylinder pressure for O2 regulator test is 1000 psi.

6.10.3.1 Configure a test gauge (P/N 4114807) using an O2 nut/stem DISS connector (P/N 4114830-006) on the hose and an O2 DISS body connector (P/N 4114830-005) on the valve body side. If the machine is configured with CSA style fittings reverse the position of the connectors.

6.10.3.2 Connect the test fixture hose to the machine's Oxygen pipeline inlet.

6.10.3.3 Connect the Oxygen pipeline supply hose to the test fixture.

6.10.3.4 Set the Oxygen flow to 4 l/min.

6.10.3.5 Depress the push button on the test device.

6.10.3.6 Release the push button. After the pressure decay stabilizes, is the regulator output pressure within tolerance given in the following table? ___ (Y)

NOTE: If a pressure decrease does not occur, either the hospital's supply pressure is too low or the regulator pressure is set too high.

Cylinder Pressure psi	USA Compensated Regulator output tolerances	Canadian Compensated Regulator output tolerances
2000	38 to 44	41 to 47
1800	39 to 45	42 to 48
1600	40 to 46	43 to 49
1400	41 to 47	44 to 50
1200	42 to 48	45 to 51
1000	43 to 49	46 to 52

(✓) 6.11 Low O2 Supply – Six Month Service Interval

6.11.1 Close the Oxygen Cylinder valve and drain all Oxygen pressure.

6.11.2 Depress the push button on the test device.

6.11.3 Adjust the Oxygen flow to 500 ml/min.

6.11.4 Release the test device push button.

6.11.5 Is the pressure on the test gauge when the "LO O2 SUPPLY" message appears on the monitor within 34 to 40 psi? ___ (Y)

6.11.6 Remove the test equipment.

(✓) 6.12 Oxygen Supply Failure Protection

6.12.1 Connect all pipeline supplies.

6.12.2 Adjust the Oxygen, Nitrous Oxide and additional gases to 4 l/min. Set CO2 Flow to 500 ml/min, if applicable.

6.12.3 Disconnect the Oxygen pipeline supply and close the Oxygen cylinder valve.

6.12.4 Do all fresh gas flows cease when the Oxygen pressure is depleted? ___(Y)

6.12.5 Reconnect the Oxygen pipeline supply.

6.12.6 Close all cylinder valves and then disconnect the Nitrous Oxide pipeline supply, and air pipeline if applicable.

6.12.7 Drain the cylinder contents then reconnect all pipeline supplies.

6.12.8 Close all flow control valves.

(✓) **6.13 Pressure Monitor**

6.13.1 Disconnect the breathing pressure sensor line from the absorber.

6.13.2 Connect a PDM Adapter (P/N 4115043) and test pressure gauge to the breathing pressure sensor line.

6.13.3 Adjust the test pressure to 0 cmH2O.

6.13.4 Simultaneously set AUTO/BAG valve to AUTO (AV2 & AV2+), or Manually turn Ventilator “ON”, and start a stopwatch.

(✓) 6.13.5 Does the “APNEA PRESSURE” alarm appear on the alarm display as a CAUTION between 13 to 17 seconds? ___ (Y)

6.13.6 Increase the test pressure slowly. Does the “APNEA PRESSURE” alarm deactivate between 10 to 14 cmH2O? ___ (Y)

6.13.7 Increase and hold the test pressure above the threshold line shown on the display, and begin timing with a stopwatch.

(✓) 6.13.8 Does the “CONTINUOUS PRES” alarm appear as a warning within 13 to 17 seconds? ___ (Y)

(✓) 6.13.9 Decrease the pressure slowly. Does the “CONTINUOUS PRES” alarm deactivate between 10 to 14 cmH2O? ___ (Y)

(✓) 6.13.10 Increase the test pressure slowly. Does a “VENT PRESS HI” alarm activate as a warning alarm between 47 to 53 cmH2O? ___ (Y)

(✓) 6.13.11 Increase the sub-atmospheric test pressure slowly. At what pressure does the “SUB ATM PRES” warning alarm activate between –7 to –13 cmH2O? ___ (Y)

6.13.12 Set the AUTO/BAG valve to BAG (AV2 & AV2+), or Manually turn Ventilator “OFF”. (VENT OFF)

6.13.13 Remove the test equipment and reconnect the breathing pressure sensor line to the absorber.

6.14 Ventilator

NOTE: Steps identified with and asterisk (*) relate to AV2 and AV2+ ventilators.

NOTE: Readjustment of inspiratory flow to limit the inspiratory plateau may be required to reduce erratic tidal volumes and breath rates caused by artifact volumes.

NOTE: Step 6.14.15 pertains to the AV2+ ventilator only.

6.14.1 Remove the bellows hose and the scavenger hose at the ventilator relief valve. Remove the bellows sub-assembly and remove bellows from mounting plate.

6.14.2 Visually inspect the bellows for deterioration particularly at it's seams and corrugations.

6.14.3 Inspect the bellows sealing O-ring, replace if necessary and reassemble the components.

6.14.4 Attach a patient circuit to the absorber system. Attach Siemens Test Lung (p/n 4115128) to patient circuit.

6.14.5 Turn ON the ventilator using the ON/OFF knob.

6.14.6 * Does the FAULT indicator turn on? (Y)

6.14.7 * Set the AUTO/BAG selector switch to AUTO.

6.14.8 * Does the FAULT indicator turn off? (Y)

6.14.9 Set the FREQUENCY to 10 BPM.

6.14.10 Adjust the Oxygen flow to 500 ml/min.

6.14.11 * Set the Pressure Limit Control to MAX.

6.14.12 Set the Tidal Volume to 1200, or if testing an external pediatric bellows set the tidal volume to approximately 300 ml.

6.14.13 Adjust the Inspiratory Flow to the bottom of the MED zone

6.14.14 Press the O2 Flush momentarily to inflate the bellows.

(✓) 6.14.15 * Press and hold the EXTENDED RANGE switch and set the I:E ratio to 2:1. Using a stopwatch, time the extended I:E ratio. Is the inspiratory time between 3.6 to 4.4 seconds and the expiratory time between 1.8 to 2.2 seconds? ___ (Y)

(✓) 6.14.16 Set the I:E RATIO to 1:2. Using a stopwatch, time the I:E ratio. Is the inspiratory time between 1.8 to 2.2 seconds and the expiratory time between 3.6 to 4.4 seconds? ___(Y)

6.14.17 Occlude the Y-piece.

6.14.18 Adjust the Inspiratory Flow until a peak pressure of 80 cm H2O is achieved.

(✓) 6.14.19 * Set the Pressure Limit Control to within the 30 range. Readjust within the band as necessary to achieve proper value, is the peak pressure at the 30 range within 27 to 33 cm H2O? ___ (Y)

(✓) 6.14.20 * Set the Pressure Limit Control to the MIN position. Is the peak pressure at the MIN range 0 to 15 cm H2O? ___ (Y) Return the Pressure Limit control to MAX.

6.14.21 Loosen the Expiratory valve (at the Spiromed), or if equipped with an Ultrasonic flow sensor, disconnect the hose attached to the exhalation valve and blow into it.

(✓) 6.14.22 Does the Reverse Flow message appear on the display? ___ (Y)

6.14.23 Tighten the expiratory valve if applicable, or if equipped with an ultrasonic flow sensor reconnect the hose between the expiratory valve and the flow sensor.

6.14.24 Insert a test minute volumeter in between absorber dome and Spiromed, or Exhalation valve and absorber dome if the system is equipped with the Ultrasonic flow sensor.

6.14.25 Open the Y-piece.

6.14.26 Turn the ventilator off and press the “VENTILATON ALARMS OFF” key to clear alarms.

6.14.27 Turn the ventilator on and start a stop watch.

(✓) 6.14.28 Does APNEA-VOLUME appear as a Caution within 13 to 17 seconds? ___ (Y)

6.14.29 Attach a 3 liter breathing bag to the Y-piece.

NOTE: Bag should be placed on a flat horizontal surface to reduce artifact volume.

6.14.30 Press the O2 Flush momentarily to inflate the bellows.

6.14.31 Set the Inspiratory Flow to the MED and readjust as necessary to fully collapse the bellows.

(✓) 6.14.32 Observe the operation of each unidirectional valve disc at eye level and make sure the inspiratory valve disc raises only during the inspiration phase, and the expiratory valve raises only during the exhalation phase.

(✓) 6.14.33 Is the tidal volume on the volume monitor and on the test volumeter within 20% of each other? ___ (Y)

6.14.34 Does the volume monitor display 10 BPM ± 1? ___ (Y)

6.14.35 Does the display correctly track the Breathing Pressure waveform? ___ (Y)

6.15 Bellows Tests – Adult / Pediatric- External / Pediatric- Internal

(✓) **6.15.1 BELLOWS - ADULT**

6.15.1.1 What is the tidal volume indicated on the test volumeter 960 to 1440 ml? ___ (Y)

(✓) 6.15.1.2 Does the bellows remain fully inflated during the expiratory pause phase? ___ (Y)

6.15.1.3 Remove the ventilator hose from the VENTILATOR HOSE terminal.

6.15.1.4 Attach a test terminal to the bellows assembly ventilator hose terminal.

6.15.1.5 Connect a 0-250 ml/min. flowmeter (P/N S000081) to the test terminal.

6.15.1.6 Set the FREQUENCY to 1 BPM.

(✓) 6.15.1.7 Is the drive gas leakage indicated during the inspiratory phase 0 to 50 ml/min.? ___ (Y)

6.15.1.8 Remove the test equipment from the ventilator hose terminal and reconnect the ventilator hose to the VENTILATOR HOSE terminal.

6.15.1.9 Set the FREQUENCY to 10 BPM.

6.15.1.10 Adjust the O2 flow to 10 l/min.

6.15.1.11 Adjust the Tidal Volume to maximum.

6.15.1.12 Press the O2 Flush momentarily to inflate the bellows.

6.15.1.13 Adjust the INSPIRATORY FLOW to fully compress the bellows.

(✓) 6.15.1.14 Is the Tidal Volume on the test volumeter greater than 1400 ml? ___(Y)

(✓) 6.15.1.15 Is the PEEP value displayed on the monitor 0 to 3 cm H2O? ___ (Y)

6.15.1.16 Remove the breathing bag from the Y-piece and replace it with a test lung.

6.15.1.17 Adjust the O2 flow to 300 ml/min.

6.15.1.18 Adjust the Tidal Volume to 200 ml.

6.15.1.19 Does the bellows stop adjust smoothly and engage properly? ___ (Y)

6.15.1.20 Adjust the INSPIRATORY FLOW to fully compress the bellows.

(✓) 6.15.1.21 Is the Tidal Volume on the test volumeter 150 to 250 ml? ___ (Y)

6.15.1.22 Close the Oxygen flow control valve.

6.15.1.23 Remove the test lung and set the AUTO/BAG selector valve to BAG.

6.15.1.24 Press the “VENTILATION ALARMS OFF” key.

6.15.2 Bellows Pediatric External - If Applicable

6.15.2.1 Adjust the fine flow control of the pediatric bellows attachment fully clockwise.

6.15.2.2 Remove the breathing bag from the Y-piece and replace it with a test lung (P/N 4115128).

6.15.2.3 Press the O2 Flush momentarily to inflate the bellows.

(✓) 6.15.2.4 Does the bellows remain fully inflated during the expiratory pause phase? ___ (Y)

6.15.2.5 Set the ventilator frequency to 20 BPM.

6.15.2.6 Adjust the O2 flow to 3 l/min.

(✓) 6.15.2.7 Is the tidal volume on the test volumeter greater then 250 ml? ___ (Y)

6.15.2.8 Adjust the tidal volume to the 100 ml mark on the pediatric bellows assembly.

(✓) 6.15.2.9 Is the tidal volume on the test volumeter 65 to 135 ml? ___ (Y)

6.15.2.10 Verify that with the Pediatric Bellows Fine Flow Control turned fully counter-clockwise the bellows does not collapse during inspiration. Readjust the knob to the fully clockwise position.

6.15.2.11 Adjust the O2 flow to 10 l/min.

(✓) 6.15.2.12 Is the PEEP displayed on the monitor 0 to 3 cm H2O? ___ (Y)

6.15.2.13 Close the Oxygen flow control valve.

6.15.2.14 Remove the ventilator hose from the VENTILATOR HOSE terminal.

6.15.2.15 Attach a test terminal (P/N 4104389) to the bellows assembly ventilator hose terminal.

6.15.2.16 Connect a 0-250 ml/min. flowmeter (P/N S000081) to the test terminal.

6.15.2.17 Set the FREQUENCY to 1 BPM.

6.15.2.18 Set the I:E RATIO to 1:1.

(✓) 6.15.2.19 Set the Inspiratory Flow to MAX.

6.15.2.20 Is the drive gas leakage indicated during the inspiratory phase 0 to 50 ml/min.? ___ (Y)

6.15.2.21 Remove the test equipment and reattach the ventilator hose to the VENTILATOR HOSE terminal.

6.15.2.22 Set AUTO/BAG valve to BAG.

6.15.2.23 Press the Alarms All Standby key.

6.15.3 Bellows Pediatric Internal - If Applicable

6.15.3.1 Remove the breathing bag from the Y-piece and replace it with a test lung (P/N 4115128).

6.15.3.2 Press the O2 Flush momentarily to inflate the bellows.

(✓) 6.15.3.3 Does the bellows remain fully inflated during the expiratory pause phase? ___ (Y)

6.15.3.4 Set the ventilator frequency to 20 BPM.

6.15.3.5 Set the O2 flow to 3 liters.

(✓) 6.15.3.6 Is the tidal volume on the test volumeter greater then 250 ml? ___ (Y)

6.15.3.7 Adjust the inspiratory flow and Pressure limit control, if applicable, control until the bellows collapses to the 100 ml mark on the pediatric bellows assembly.

(✓) 6.15.3.8 Is the tidal volume on the test volumeter 65 to 135 ml? ___ (Y)

6.15.3.9 Adjust the O2 flow to 10 l/min.

(✓) 6.15.3.10 Is the PEEP displayed on the monitor 0 to 3 cmH2O? ___ (Y)

6.15.3.11 Close the O2 flow control valve.

6.15.3.12 Remove the ventilator hose from the ventilator hose terminal.

6.15.3.13 Attach a test terminal to the bellows assembly ventilator hose terminal.

6.15.3.14 Connect a flowmeter test stand (P/N S000081) to the test terminal.

6.15.3.15 Set the frequency to 1 BPM.

6.15.3.16 Set the I:E RATIO to 1:1.

(✓) 6.15.3.17 Is the flow indicated during the inspiratory phase less then 50 ml? ___ (Y)

6.15.3.18 Remove the test equipment and reattach the ventilator hose to the VENTILATOR HOSE terminal.

6.15.3.19 Return pressure limit control to MAX.

6.15.3.20 Set AUTO/BAG valve to BAG.

6.15.3.21 Press the Alarms All Standby key.

6.16 SPO2/Pulse

(✓) 6.16.1 NELLCOR

6.16.1.1 Plug the SpO2 sensor pre amp cable into the machine interface.

6.16.1.2 Disconnect the Durasensor from the interface cable and pre-amp and attach a Nellcor® pocket simulator Model 2500.

6.16.1.3 The monitor should display a value between 80 and 82 for oxygen saturation and a value between 60 and 62 for a pulse rate if the machine is equipped with a Nellcor MP-202 pulse oximeter module. Record the values on the report.

6.16.1.4 If the machine is equipped with a Nellcor MP-203 pulse oximeter module, the pulse rate displayed should be between 39 and 41.

6.16.1.5 Disconnect the pocket sensor and re-connect the finger probe.

6.16.1.6 Attach the sensor to the operator's finger and obtain a pulse and oxygen saturation.

6.16.1.7 Disconnect the sensor from the finger.

6.16.1.8 After ten (10) seconds, the Warning message "NO SpO2 PULSE" shall appear on the central alarm display and a continuous audible alarm shall sound.

6.16.1.9 Set SpO2 monitor to Standby.

(✓) 6.16.2 NOVAMETRIX

6.16.2.1 Plug the SpO2 sensor extension cable into the machine interface.

6.16.2.2 Disconnect the finger probe from the extension cable and attach a Novametrix TB500B sensor simulator to the extension cable.

6.16.2.3 Turn the System Power switch to ON.

6.16.2.4 Set the simulator's Sensor Type switch to 87XX. Set the output signal to 3 and the saturation to 82%. Turn the simulator ON and verify that the monitor's displayed Pulse reading is 60 ±1 BPM and the SPO2 reading is 82 ±2.

NOTE: Do not rely on the simulator's low battery LED as an indicator of sufficient battery power. Replace the battery with a fresh 9 volt transistor battery if proper measured values are not obtained and the battery measures 8.5 VDC.

6.16.2.5 Adjust the simulator's saturation setting to 100 and verify that the monitor indicates 99 ±1. Adjust the saturation to 62 and verify that the monitor indicates 62 ±2.

6.16.2.6 Depress the Open Test RED key and verify that the PULSE LO message is displayed in the Alarm display, a continuous audible alarm is heard, and a NO OXI PULSE alarm is shown on the alarm display.

6.16.2.7 Depress both Open Test keys together and verify alarm messages SaO2 and OXI ALARMS DISABLE appear on the alarm display, a single audible tone is heard, and OXI SEN DISC advisory alarm is shown on the alarm display. Release the Open Test keys.

6.16.2.8 Disconnect the simulator and re-connect the finger probe. Attach the sensor to the operator's finger and obtain pulse, and oxygen saturation readings. Disconnect the sensor from the finger. After ten (10) seconds, the Warning message NO OXI PULSE shall appear on the central alarm display and a continuous audible alarm shall sound.

6.16.2.9 Remove finger from sensor and set the SpO2 monitor to Standby.

6.17 NIBP Tests

NOTE: For the following tests, access the MONITORS and NIBP Service Screen as outlined in Section 2.

(✓) 6.17.1 NIBP Inflation Pressure Test

6.17.1.1 Wrap an adult BP cuff loosely around a cylindrical object. Attach, in series, a tee fitting with a calibrated manometer between the patient cuff and the hose assembly.

6.17.1.2 Bring up the MONITORS service screen and select NIBP.

6.17.1.3 Touch the INFLATE key. The pressure displayed on the test 170 - 190 mm Hg. Touch the STOP key to end the test.

(✓) 6.17.2 NIBP Inflation Time Test

6.17.2.1 Touch the INFLATION CHECK key. The MEAN value displayed shall not be greater than 73, indicating the time (in x.x seconds), to reach a pressure of 250 mm Hg.

6.17.2.2 The PULSE value displayed shall not be greater than 73, indicating the time (in x.x seconds), to reach a pressure of 300 mm Hg.

NOTE: Test failure may be due to cuff wrapped too loosely, or cuff may be too large. Use an adult cuff.

(✓) 6.17.3 NIBP Leak Test

6.17.3.1 Touch the LEAKAGE CHECK key. After one minute, the SYSTOLIC value displayed shall be between 280 and 300.

6.17.3.2 After the test has completed, the DIASTOLIC value displayed shall not be greater than 8 (indicating the amount of pressure drop at the end of the test period).

6.18 CO2/ Agent Analyzer Test

NOTE: Before performing the accuracy test, the Multispec must be in the full accuracy mode. The CO2 and Agent warm-up messages shall not appear on the advisory display.

NOTE: Before performing the accuracy test, the oxygen analyzer must display 21% FIO2. The sensor must be exposed to ambient air during the entire Multispec accuracy testing.

(✓) **6.18.1 Sample Flow Test**

6.18.1.1 Verify that an oxygen supply is connected to the machine.

6.18.1.2 Examine the external sampling components, consisting of the sample line, filter asm and hose and auxiliary water trap. Replace any components as needed.

6.18.1.3 Connect a 0-250 ml flowmeter to the patient sample exhaust port.

6.18.1.4 Verify that the sample flow is within 175 to 225 ml/min.

(✓) **6.18.2 Line Block Test**

6.18.2.1 Remove the calibration gas cylinder from the multispec calibration adapter.

6.18.2.2 Set both flow control valves on the multispec calibration adapter fully counter-clockwise.

6.18.2.3 Attach the patient sample line to the luer lock fitting on the calibration adapter.

6.18.2.4 Turn the flow control valve clockwise until the flowmeter indicates 75 ml/min.

6.18.2.5 Verify that a "Line Block" message illuminates on the remote display in approximately 15 seconds.

6.18.2.6 Remove the test equipment.

(✓) **6.18.3 Accuracy Test**

6.18.3.1 Press the "MONITOR SETUP" key. Touch the "CO2 CAL" soft key on the left monitor display.

6.18.3.2 Touch the "SELECT" soft key on the right display, and configure the display to indicate "HAL".

6.18.3.3 Press the "DATA" key. Touch the "GAS ANALYSIS" soft key if it is not illuminated.

6.18.3.4 Attach the CO2 calibration adapter assembly (P/N 4110216 A) to the CO2 calibration cylinder (P/N 4107979 P)

6.18.3.5 Turn the flow control valve on the calibration adapter slightly counter-clockwise.

6.18.3.6 After the CO2 waveform peaks on the remote display, turn off the flow and remove the sample line from the calibration adapter.

6.18.3.7 Verify that the "EXP" CO2 display indicates within 36.0 to 40.0 mm Hg.

6.18.3.8 Verify that the "EXP" halothane on the agent display indicates within 0 to 0.4%

6.18.3.9 Verify that the "EXP" N2O indicates within 32.0 to 38.0%.

NOTE: If any reading is outside of the Multispec tolerance limits, the Multispec analyzer must be recalibrated in accordance with the procedure given in Section 5, and then Procedure 6.19 must be repeated.

(✓) 6.19 Open Reservoir - Cleaning and Testing 6-Month Service Interval, If Applicable

NOTE: If the ambient air in the local environment contains a significant amount of dust and lint, the cleaning frequency must be increased to compensate for these conditions.

6.19.1 OPEN RESERVOIR SCAVENGER CLEANING

6.19.1.1 Remove the scavenger hoses and drain all accumulated moisture. Inspect all scavenger hoses for deterioration and replace as needed.

6.19.1.2 Disconnect the hospital vacuum source from the scavenger.

6.19.1.3 Cleaning procedure for assemblies with 2 large relief ports. If configured with many small vent ports skip to step 6.19.1.4.

6.19.1.3.1 Remove the four screws securing the reservoir tube to the main block. Examine the two sealing O-rings and replace as necessary.

6.19.1.3.2 Remove the screws securing the access panel at the bottom of the scavenger canister.

6.19.1.3.3 Remove and inspect the silencer; replace if needed.

6.19.1.3.4 Clean the reservoir tube with compressed air if necessary.

6.19.1.3.5 Remove the flowmeter from its housing by turning it counterclockwise.

6.19.1.3.6 Inspect the tube and clean with compressed air if needed.

6.19.1.3.7 Apply vacuum to the port at top of the flowmeter housing.

6.19.1.3.8 Go to step 6.20.2.

6.19.1.4 Cleaning Procedure for Open Reservoir Scavenger with many small vent holes

6.19.1.4.1 Remove the scavenger mounting screws.

6.19.1.4.2 Remove the scavenger flow control needle valve assembly. Inspect the needle valve and seat for lint or dust accumulation. Clean with compressed air if necessary.

6.19.1.4.3 Remove the hardware securing the flowmeter. Remove the brass retainer at the bottom of the assembly. Inspect the for lint or dust accumulation. Clean with compressed air if necessary.

6.19.1.4.4 Unthread the reservoir canister from the body.

6.19.1.4.5 Remove the hardware securing the tube assembly to the block. Inspect for lint or dust accumulation. Clean with compressed air if necessary and replace O-rings if necessary.

6.19.1.4.6 Probe all gas passages of the block to ensure there are no occlusions. Clean with compressed air if necessary.

6.19.1.4.7 Reassemble the scavenger assembly, attach the scavenger hose and reactivate the vacuum source.

6.19.2 OPEN RESERVOIR PRESSURE TESTING

6.19.2.1 Activate the Scavenger vacuum supply.

6.19.2.2 Turn the scavenger needle valve fully clockwise (closed).

6.19.2.3 Uncap the hose barb adapter at the rear of the scavenger and connect a test pressure monitor to the hose barb on the adapter using a PDM/Suction Adapter (P/N 4115038). If the scavenger does not contain a hose barb adapter install a scavenger adapter (P/N 4108114) between the 19-mm hose terminal on the scavenger and the scavenger hose.

6.19.2.4 Interconnect the inspiratory and expiratory valves or expiratory port on the ultrasonic flow sensor, if applicable, with a 22-mm hose.

6.19.2.5 Attach a Breathing System Leak Test Device (P/N S010159) to the bag mount.

6.19.2.6 Set the AUTO/BAG valve to the BAG position.

6.19.2.7 Open the APL valve.

6.19.2.8 Set the Oxygen flow on the anesthesia machine to 8 l/min.

6.19.2.9 The test pressure gauge shall indicate a pressure of less than 1.0 cm H2O.

6.19.2.10 Close all flow control valves on the anesthesia machine.

6.19.2.11 Adjust the scavenger needle valve until the flowmeter indicates between the white lines.

6.19.2.12 What is the pressure on the test gauge? ___ cm H2O (0 to -0.5)

6.19.2.13 Remove the test equipment, re-cap the scavenger adapter port or remove the scavenger adapter and reconnect the scavenger hose.

(✓) 6.20 A/C Scavenger- Cleaning and Testing 6 Month Service Interval, If Applicable

NOTE: If the ambient air in the local environment contains a significant amount of dust and lint, the cleaning frequency must be increased to compensate for these conditions.

6.20.1 A/C SCAVENGER CLEANING

6.20.1.1 Remove the scavenger hoses and drain any accumulated moisture. Inspect the hoses for deterioration, then reinstall or replace it if needed.

6.20.1.2 Remove the safety relief valve housing by unscrewing it in a counter-clockwise direction.

6.20.1.3 Inspect the O-ring and replace it if needed.

6.20.1.4 Remove the safety relief valve from its housing by twisting it out in a counter-clockwise direction. The tips of needle nose pliers can be used to turn the valve. Be careful not to damage the valve's fragile disk.

6.20.1.5 Remove any accumulated lint or dust from the valve with a soft brush. The valve may be further cleaned with a low flow of Air or Oxygen. The scavenger body can be cleaned with a moist cloth.

6.20.1.6 Reinstall the valve into the housing, making sure that it is threaded all the way into the housing and that the plastic washer is properly seated on its upper surface.

6.20.1.7 Reinstall the valve housing onto the scavenger body, making sure that the O-ring is properly seated.

6.20.2 AC SCAVENGER TESTING

6.20.2.1 Set the AUTO/BAG valve to the BAG position.

6.20.2.2 Open the APL valve.

6.20.2.3 Occlude the bag mount connector with a Breathing System Leak Test Device (P/N S010159).

6.20.2.4 Interconnect the inspiratory and expiratory valves or expiratory port on the ultrasonic flow sensor, if applicable, with a 22-mm hose.

6.20.2.5 Set the Oxygen flow on the anesthesia machine to 8 l/min.

6.20.2.6 Install a scavenger adapter (P/N 4108114) between the 19-mm hose terminal on the scavenger and the scavenger hose.

6.20.2.7 Connect a test pressure monitor to the hose barb on the adapter using a PDM/Suction Adapter (P/N 4115038).

6.20.2.8 Remove the transfer hose from the bottom of the scavenger and occlude this port.

6.20.2.9 What is the pressure on the test gauge? ___ cm H2O (5 to 10)

6.20.2.10 Remove the test equipment and reconnect the scavenger hose and the transfer hose.

6.20.2.11 Close the Oxygen flow control valve.

(✓) 6.21 Bag Scavenger Cleaning and Testing – Six Month Service Interval, If Applicable

NOTE: If the ambient air in the local environment contains a significant amount of dust and lint, the cleaning frequency must be increased to compensate for these conditions.

6.21.1 BAG SCAVENGER CLEANING

6.21.1.1 Remove the scavenger hoses and drain any accumulated moisture. Inspect the hoses for deterioration, then reinstall or replace as needed.

6.21.1.2 Remove the reservoir bag and drain any accumulated moisture and inspect it for deterioration, then reinstall or replace as needed. All under sized or single use bags must be replaced with 5-liter reusable style reservoir bag.

6.21.1.3 Remove the plastic valve cover on the front surface of the scavenger body by turning it in a counter-clockwise direction.

6.21.1.4 Remove the valve and washer from the scavenger body by turning it counter-clockwise. A needle-nose pliers may be used to turn the valve, but use care not to damage the valve's fragile disk.

6.21.1.5 Brush any accumulated lint or dust off the valve with a soft brush. The valve may be further cleaned with a low flow of clean Air or Oxygen.

6.21.1.6 Reinstall the plastic washer and valve into the scavenger body. Replace the valve cover.

6.21.1.7 Unscrew the valve housing on the left side of the scavenger body by turning its fitting counter-clockwise with a wrench.

6.21.1.8 Unscrew the valve from the housing by turning it in a counterclockwise direction.

6.21.1.9 Brush any accumulated lint or dust off the valve with a soft brush. The valve may be further cleaned with a low flow of clean Air or Oxygen.

6.21.1.10 Reinstall the valve in the housing, and then reinstall the housing into the scavenger body.

NOTE: This valve does not require washers or O-rings.

6.21.1.11 Remove the valve housing on the right side of the scavenger body by turning it counter-clockwise.

6.21.1.12 Inspect the rubber O-ring and replace if worn.

6.21.1.13 Remove the valve from the housing by turning it counterclockwise. A needle-nose pliers may be used to turn the valve, but use care not to damage the valve's fragile disk.

6.21.1.14 Brush any accumulated lint or dust off the valve with a soft brush. The valve may be further cleaned with a low flow of clean Air or Oxygen.

6.21.1.15 Reinstall the valve and plastic washer into the housing.

6.21.1.16 Reinstall the valve housing onto the scavenger body, making sure that the O-ring is properly seated.

6.21.2 BAG SCAVENGER TESTING

6.21.2.1 Activate the Scavenger vacuum supply.

6.21.2.2 Turn the scavenger needle valve fully clockwise (closed).

6.21.2.3 Install a scavenger adapter (P/N 4108114) between the 19-mm hose terminal on the scavenger and the scavenger hose.

6.21.2.4 Connect a test pressure monitor to the hose barb on the adapter using a PDM/Suction Adapter (P/N 4115038).

6.21.2.5 Set the AUTO/MAN valve to the BAG position.

6.21.2.6 Connect a 22mm breathing hose between the absorber's inspiratory valve and expiratory valve or expiratory hose terminal on the ultrasonic flow sensor, if applicable.

6.21.2.7 Open the APL valve.

6.21.2.8 Occlude the bag mount connector.

6.21.2.9 Press the O2 Flush button to inflate the scavenger reservoir bag.

6.21.2.10 Open the Oxygen flow control valve to 8 l/min.

6.21.2.11 Observe the pressure reading on the test gauge. The gauge shall indicate a pressure of <10.0 cmH2O.

6.21.2.12 Adjust the scavenger needle valve to allow typical suction through the scavenger.

6.21.2.13 Close all flow control valves on the machine.

6.21.2.14 The gauge shall indicate a pressure of <-1.0 cmH2O.

6.21.2.15 Remove the test equipment and reconnect the scavenger hose.

6.21.2.16 Close the Oxygen flow control valve.

(✓) 6.22 Suction Regulator – 6-month Service Interval, If Applicable

6.22.1 Set the vacuum on/off valve to the ON position.

6.22.2 Set the regulator to indicate 250 mmHg.

6.22.3 Connect a digital pressure meter to the collecting inlet stem of the suction bottle.

6.22.4 Set the digital pressure meter to the mmHg scale.

6.22.5 Is the vacuum indicated on the digital pressure meter 200-300 mmHg? ___ (Y)

6.22.6 Set the vacuum on/off valve to the OFF (vertical) position.

6.22.7 Turn the vacuum control knob fully counter-clockwise.

(✓) **6.23 Manual Sphygmomanometer - 6-month Service Interval, If Applicable**

6.23.1 Insert the male Luer fitting of the Sphygmomanometer squeeze bulb hose assembly into the female Luer fitting labeled BP BULB on the front of the machine.

6.23.2 Insert an NIBP-Luer Test Adapter (P/N 4116111-001) inline between the blood pressure cuff and the extension hose.

6.23.3 Wrap the blood pressure cuff around an "E" cylinder.

6.23.4 Hand-pump the squeeze bulb until pressure of 200 mm Hg is indicated on the test gauge and start a stop watch.

6.23.5 Does the Sphygmomanometer indicate 180 to 220 mm Hg? ___ (Y)

6.23.6 After thirty (30) seconds, is the pressure on the Sphygmomanometer gauge 190 to 200 mm Hg? ___ (Y)

6.23.7 Remove test equipment.

6.23.8 Remove the blood pressure cuff from the "E" cylinder.

6.23.9 Does the Sphygmomanometer indicate within the band? ___ (Y)

(✓) **6.24 Final Tests**

6.24.1 Is the machine's Operator's Instruction manual in close proximity of the machine? ___ (Y)

6.24.2 Unplug the machine AC power cord. Is the yellow, “AC POWER FAIL” LED lit? ____ Y

(✓) 6.24.3 Press and hold the “Battery Test” button. Is the green, “BATTERY TEST” LED lit and does the yellow, “BATTERY LOW” LED remain unlit? ___ Y

6.24.4 Plug machine power cord into known good AC outlet.

(✓) 6.24.5 Does the Auxiliary Lamp function properly? (if applicable) ___ (Y)

6.24.6 Verify all cylinder pressure gauges indicate zero.

6.24.7 Verify the pipeline hoses are connected to the hospital pipeline.

6.24.8 Verify the APL valve knob is turned completely counterclockwise (fully open).

6.24.9 Place the AUTO/BAG selector in the BAG position.

6.24.10 Verify the ventilator hose is connected between the Auto/Bag valve and Ventilator hose terminal.

6.24.11 Verify the pressure pilot line is connected between the machine interface and absorber.

6.24.12 Verify the Oxygen sensor is removed from the inspiratory valve dome adapter.

6.24.13 Verify that the inspiratory valve dome is plugged.

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